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ABSTRACT

This report contains a collection of papers presented at a workshop on telecommunications-based training systems as part of the DELTA (Developing European Learning through Technological Advance) Action Line III, which addressed research in telecommunications for open and distance education. The following presentations are included: (1) "Opening Addresses" (Jose Caballero Guerrero and Francisco Martinez Martinez); (2) "R&D on Telematics Systems for Flexible and Distance Learning" (Luis Rosello); (3) "Telecom Systems for Training" (Jacques Babot); (4) "EPOS: Building a Working Open Learning Service" (Richard Walker); (5) "Education via Satellite: Technology in the Boardroom and in the Classroom" (Polly Rash); (6) "Corporate Training by Advanced Telecommunications" (Friedrich von Stachelsky); (7) "Telecommunication Based Training, OLE Project" (Mette Ringstet); (8) "The Open Laboratory for New Learning Approaches" (Enrico Rovida); (9) "IBM Distance Learning Developments Using Video-Conferencing" (Barry Scott and Jesus Rueda); (10) "Somewhere, over the Rainbow...On Satellites, Distance Education, and EuroPACE" (Soren Nipper); (11) "Options for EUROSTEP" (Johan van Heddegem); (12) "Satellite Medical Education and Data Transfer: Opportunities and Pitfalls" (Paul R. Grob); (13) "Pan European Interactive Satellite Communication for Distance Learning" (Medhi Nouri and Paul Bacsich); (14) "Overview of CAPTIVE" (David Gordon Jameson); and (15) "Looking to the Future: Options for Development of Channel e: the European Educational Television Broadcasting Service on Astra Satellite" (Philip Crookes). Round table discussions and closing addresses are also included and lists of board members and participants and a program agenda are appended. (DB)

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Proceedings of the Workshop

TBT
Telecommunications Based Training in the 90s

(DELTA Programme - Action Line III)

edited by:

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Thanks, are due to the Steering Committee as well as to all those who have helped in order to make this seminar such a success. In particular, the Telecommunications operators namely Telefónica, France Telecom and Deutsche Bundespost Telekom. These companies' efforts meant that we were able to view demonstrations on-line. Thanks also to Eurostep and ESA for the retransmission via OLYMPUS and last but certainly not least particular thanks go to FUNDESCO, and the DELTA team for their support and enthusiasm which have made an important contribution to the success of this Workshop.

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*) FUNDESCO (E) : "Fundación para el Desarollo Social de las Comunicaciones" is partner of the PRECISE consortium (DELTA project D1025).

Foreword

Foreword

The mandate of the DELTA Exploratory Action Programme (Developing European Learning Through Technological Advance) was to identify requirements, opportunities and actions and to make recommendations to actors who are working in the area of Advanced Learning Technology.

This workshop "Telecommunications Based Training Systems in the 90's" was organised to present some of the interim results of the research carried on within the Action Line III of DELTA. This Action Line addressed the research in the field of Telecommunication systems for open and distance education.

Telecommunications will be as Ariadne's lifeline, leading the learner to the teacher, giving a human dimension to the flexible and distance learning beyond the possibilities of local Computer Based Training.

Remote control, wideband, multi-media, high definition, direct transmission and digital interactivity are some of the multiple technical facets of communication which can provide an invaluable contribution to the learning process.

Distance learning using advanced communication is one of the future benefits that added value services, through telecommunication networks can convey.

The exploitation of the potential that the use of satellites and, even, telecommunications to the improvement of distance learning, was one of the objectives of the DELTA Exploratory Action.

Not only is "Telecommunications Based Training in the 90's" linked to a variety of works and experiments under DELTA but it also shows the state of the art beyond the limits of the programme.

The presentations of DELTA projects, discussions and round tables dealing with the advanced research outside the "DELTA world" in Europe and in the USA as well as some real-life demonstrations, using the Telecommunications network and direct broadcasting satellites have allowed the perticipants to understand the objectives and intermediate results of DELTA.

Jacques BABOT
DELTA Central Office

Plenary Sessions

Chairman:
Mr. Luis Roselló, CEC, Brussels
Mr. Brian Ross, CEC, Brussels
Mr. Peter Zorkoczy, Open University, UK

José Caballero Guerrero
General Director of Resources
Telefónica de España, S.A.

In the name of Telefonica's President and in my own, I would like to welcome you to the "Telecommunications Based Training System in the 90's" Seminar promoted by DELTA and organized by FUNDESCO. As you know, the Seminar deals with Action Line III of DELTA and therefore the final objective is to develop the infrastructure necessary for these types of systems through collaboration among European institutions.

In this brief introduction, I shall not analyze the subjects to be debated by distinguished specialists during the Seminar, but allow me as a Director and more specifically as the person responsible for our Company's resource policy, to share with you my concern about the rate of incorporation of telecommunications to modern training systems. This concern is shared by the majority of directors of other companies and I suppose also by those in charge of the official educational system.

It is obvious that in a society dominated by Information Technologies and Telecommunications in which continuous training is essential and where it is necessary to invest greater amounts of resources in training, traditional solutions cannot meet, in quality or quantity, these demands. Therefore it is essential to find new models, methods and tools that will solve or at least relieve the problem.

In this sense, during the 70's and 80's we witnessed a major growth in the use of video and computer science applied to training. However these technologies which have been, and will continue to be, of great aid in the training field, require an element capable of uniting all parties in order to develop a real system. In other words, they require telecommunications. Therefore, in my opinion, it is difficult to explain why telecommunications have hardly been used in this field, especially if we take into account, that from a technological point of view, telecommunications are chronologically previous to video or computer science.

Undoubtedly the reasons for this situation are diverse and include: technological problems, cost, problems in the assimilation of technologies, lack of motivation, etc. It would be presumptuous on my part before this forum of experts to diagnose the problem in a simplistic manner and therefore I shall only propose that each of us contribute as best we can, both economically and through collaboration between public and private institutions. An example of this cooperation is the EPOS Project developed by the majority of the European PTTs together with universities and training companies.

In short, I would ask:

- that institutions such as the EEC or Governments continue to promote research programs such as DELTA and progressively increase financing of private initiatives.

- that the PTTs put into operation as soon as possible networks for transportation and interconnection between users such as ISDN.

- that official educational institutions, through informative campaigns, promote the use of Information Technologies and Telecommunications in training systems.

- that those in charge of training also become familiar

with and use these technologies, which should ease learning and make it more attractive. However, we should not fall into an extreme use of technology that does not take into account individual problems.

- that students overcome their unwillingness to use these systems and come to see them as tools that will aid their personal development.

It is my hope that seminars such as the one we inaugurate today will help to diagnose problems, propose solutions and hasten the availability of systems that will improve the quality of training and enlarge its range of action. In this manner, we can improve the quality of our personnel and of our companies.

Lastly, I would like to congratulate DELTA for its initiative in promoting this seminar and thank all the participants and the institutions you represent for your collaboration in the success of this seminar. At the same time I wish you all a pleasant visit to our country.

Francisco Martínez Martínez
President of the Executive Committee
FUNDESCO

First of all I would like to welcome you on behalf of FUNDESCO to this TBT seminar. It is a great pleasure for us to act as hosts of this important event that closes the Exploratory Phase of the DELTA Programme. I believe I am justified in congratulating us all on the success and international importance of this Phase.

We can look with satisfaction at the technical progress that has been made. In the case of FUNDESCO the repercussion of the DELTA Programme on society is particularly significant. Our organization was created by the Spanish Telephone Company twenty years ago, and one of its main objectives is precisely to promote the analysis, debate and projection of the enormous possibilities of Information Technologies and Telecommunications in society. Before an audience like this, it is not necessary to insist on the importance of training as a key factor for the evolution and modernization of society. This approach has always highlighted FUNDESCO's interest in the field of education and training and in particular its participation in the DELTA Programme from the very start.

However, our vast experience in the integration process of Information Technologies in society forces us to be extremely cautious when applying such technologies to training. Due not only to the special characteristics of this sector but also to the cultural peculiarities of each country.

We are now on the threshold of the next Phase of the DELTA Programme, and the approval of this second phase is a motive of satisfaction for all of us. I would like to point out some aspects contemplated in the recommendations of the DELTA Programme. I am referring in particular to the importance of the Pilot tests considered as fundamental actions in Part III of the DELTA Workplan for the new Phase. We believe these experiments are absolutely essential if we want to promote the social integration of Information Technologies and Telecommunications in the training environment. In our opinion such pilot tests and experiments should be carefully designed so that they will really produce a solution to education problems where they actually exist. It is not enough just to carry out technological tests in sectors of the public that are already highly motivated by the most recent and spectacular advances in technology.

We are also concerned about the educational quality of products and services offered to the general public. The lack of quality from the users' point of view can deter them from accepting new technologies thus provoking a feeling of rejection which is difficult to overcome.

I sincerely hope that by holding this seminar in Spain the education authorities, institutions and firms in the sector will feel more inclined to play a more relevant role in the next Phase of the DELTA Programme. Regarding FUNDESCO I would like to emphasize our wish to take part in the following lines of action that cover the areas of concern that I have just mentioned.

* Evaluation of TBT applications
* Multimedia learning environment
* Pilot experiences of course delivery systems.

I would now like to concentrate for a moment on the organizational aspects of this seminar. It is a pleasure for me to point out the valuable contribution

of the members of the Advisory Board who have collaborated in the planning and organization of this event.

Also worthy of mention is the support of all the sponsors, who sensitive to the initiative of the DELTA Programme, responded to our invitation and in fact have made this seminar possible.

Let us now look at the actual programme of this seminar. Since it is taking place at the end of the Exploratory Phase of DELTA and on the threshold of the next phase, we have requested all the speakers to centre their presentations on the main conclusions of the work carried out so far and the future lines of research that they propose.

We believe that one of the main contributions of Programmes such as DELTA in the European research community is the unification of action lines, thus facilitating a consensus among all the actors involved. In this sense, I would like to encourage all the participants to take an active part in the Round Tables as well as during the question and answer times at the end of each presentation in the Plenary Sessions. Our aim is to provide you with the opportunity for an international exchange of information and expertise which will contribute as far as possible to such a consensus.

Finally, thank you all, both speakers and delegates, for contributing to the success of this seminar and I wish you an enjoyable stay in our city.

R&D on Telematics Systems for Flexible and Distance Learning

Luis Roselló
Head of DELTA Unit - DG-XIII
Commission of the European Communities

Introduction

During the sessions of this Workshop, you will have the opportunity to get first hand information on the developments and results of the research carried out by the projects within the DELTA Exploratory Action in the area of telecommunications and mainly with regard to the utilisation of satellites for flexible and distance learning, but before starting it is worth summarising the overall achievements and to look into the future perspective that this research is opening up. This is of special interest today because of the new actions that the Commission is going to undertake under the new Framework Programme.

Results of the Exploratory Action

DELTA was able to raise a great deal of interest in the broad spectrum of the Advanced Learning Technologies community all over Europe. Its specificity, as the single and unique programme tackling this field at a European level attracted high expectations, in spite of the scarce resources allocated to enable a full achievement of the ambitious goals initially stated. On top of the real research done by the projects themselves and the concertation mechanisms set up amongst them, a lot of accompanying actions provided more momentum to this field. Just to recall some of them, I would mention the awareness actions carried out by some action line I projects, one of them, of course, the organisation of this event, the human and technological networks established, the various workshops organised by the Commission and some projects in order to disseminate their own results and the DELTA Conference held in The Hague.

In parallel with the Exploratory Action, and with a view to the future, the Operation 92 exercise led to the identification of the strategies for the 90's, the requirements' analysis, and the definition of the objectives and scope of the future R&D tasks to be undertaken in the future. The findings, jointly with the results of the projects are being used for preparing the new workplan.

I will synthesize the main outcomes of the Exploratory Action in the light of the final evaluation report drafted by a team of independent assessors. "In the view of the team of assessors, the Exploratory Action was succesful in stimulating incremental research and development in an area of central importance for the future of Europe. The programme has produced a number of significant results and even led to development of products and services that are at the point of immediate exploitation on the market. It has furthermore played a decisive role in focusing the future research and development effort in the area of learning technology on the most significant issues, and thereby fulfilled the central role of an Exploratory Action...".

DELTA Exploratory Action has achieved a series of concrete results on several aspects: concept formation and concertation of actors, testing and validation, the research in advanced learning systems, the overcoming of technical barriers and the overcoming of market barriers.

I - An important result of DELTA is its achievements in terms of **concept formation and concertation of actors.**

This is a primary supportive action for the DELTA Exploratory Phase. At all projects there is on-going work to develop and elaborate concepts for future learning technology systems. Under Action Line I and Action Line V, research is made on the identification of **users, providers and producers requirements.** Several DELTA projects are working together in the establishment of a platform for **the continuous exchange of information** based on their own findings and on the results achieved in the other Action Lines.

Beyond this concertation, **the development of technical concepts** is taking place within a number of projects under Action Lines II and III. Considerable effort is being expended on a software platform which would ensure greater portability between different proprietary computer-based systems.

On top of the above it is worth noting that some key players, the PTT Operators, have joined their efforts in a concerted maner to define a common European platform for the delivery of open learning services. You will learn more about this in the presentation of the project.

II - The enhancing of existing technology to meet learning needs, is a core aspect dealt with mainly in AL II: **the research in advanced learning technology systems.**

The specification of the Portable Educational Tool Environment was a milestone in the definition of common functional specifications for learning systems allowing portability and interoperability. It included the realisation of a prototype of a low level portability layer that allows properly designed courseware to run on the main operating systems.

Some other results in the specification or prototype stage are described below.

New advanced multimedia authoring tools including learner modelling facilities, and enabling authors to define a course in terms of pedagogical objectives, instead of computer frames; tools for easy access to learning materials supporting the learners to define their own curricula; tools to add tutoring and monitoring facilities to existing computer applications; specifications and prototyping of hypermedia based learning systems; a prototype architecture for distributed authoring; prototypes based on artificial intelligence tools to build models of the learner; prototypes for the reusability of learning materials; databases of video sequences and still pictures and a system for their broadcasting via satellite and broadband cable links; an encryption system for broadcasting educational materials.

These are some of the tangible results of tools and systems aimed at in the original DELTA objectives and that are now avaible two years later. The shared objective of this research was to **create new levels of efficiency and cost savings in the learning process**

III - **Testing and Validation** is another important result of the present phase.

Most of the projects have an element of validation and testing built into them. In Action Line III, projects worked on key aspects of the development of a **communications infrastructure for delivery and production of courseware** and for the exchange of information about courseware, investigating the critical issues of tariffing, encryption, multimedia transmission by satellite. A range of experiments has been carried out making use of the telecomunication facilities, such as teleconferencing or videoconference systems for learning in a distributed environment, the "virtual classroom", that you will have the opportunity to watch and participate in a live demonstration.

A comprehensive collection of case studies of successful experiences in the use of technologies for learning and state of the art studies have been made available, completing the findings of the actual experiments and thus providing an important foundation for the future experiments.

On top of that, the research included essential fields for trans-European cooperation such as cross-cultural comparisons.

IV - **Overcoming technical barriers** is another main thrust of DELTA.

The effort was directed mostly at the problem of **improving the portability of software** and at the definition of standards.

There are, at present, no specific standards for educational technology. A great effort has been made by Action Line IV projects to recommend specifications, conventions and standards for advanced learning technology on top of existing and emerging standards and conventions and the ones defined in other Community programmes such as RACE and ESPRIT. More specific work is done on aspects such as:

- identification of common and standardised systems architecture for authoring and learning environment (OSID)
- interfacing and communication protocols for telecommunicationapplications in training.

V - The action also dealt with an important issue for the real market uptake of learning technologies in Europe **which is the overcoming of market barriers.**

Several projects are examining market segmentation in the training environment, **attempting to assess the adequateness of particular technologies for different market segments.**

Case studies of successful products have been produced in order to provide a series of criteria analysing the market success or failures in the use of technology for training. An inventory of best practices in the production process of computer-based learning materials and a cost-benefit analysis of multilingual cross border broadcasting of educational material have been made.

Other specific issues are being investigated and they address aspects such as the requirements of peripheral regions of the Community, the uptake of computer-based learning in Small and Medium Sized Enterprises, the assessment of the demand for expert systems in vocational training and the promotion of the use of those systems in the Community.

Dissemination

The **dissemination** of the more important results is now under way. The DELTA Conference has been a milestone in reaching wider audiences. This Workshop will contribute to the awareness of the results in the area of telecomunications which is an essential element in any delivery system for flexible and distance learning.

Development of transeuropean telematic networks and systems applied to:	*as M'ecu*
Administration	41,3
Transport Services	124,4
Health-care services	97
Distance learning services	54,5
Libraries	22,5
Research and technological development in linguistics	22,5
Rural areas	14

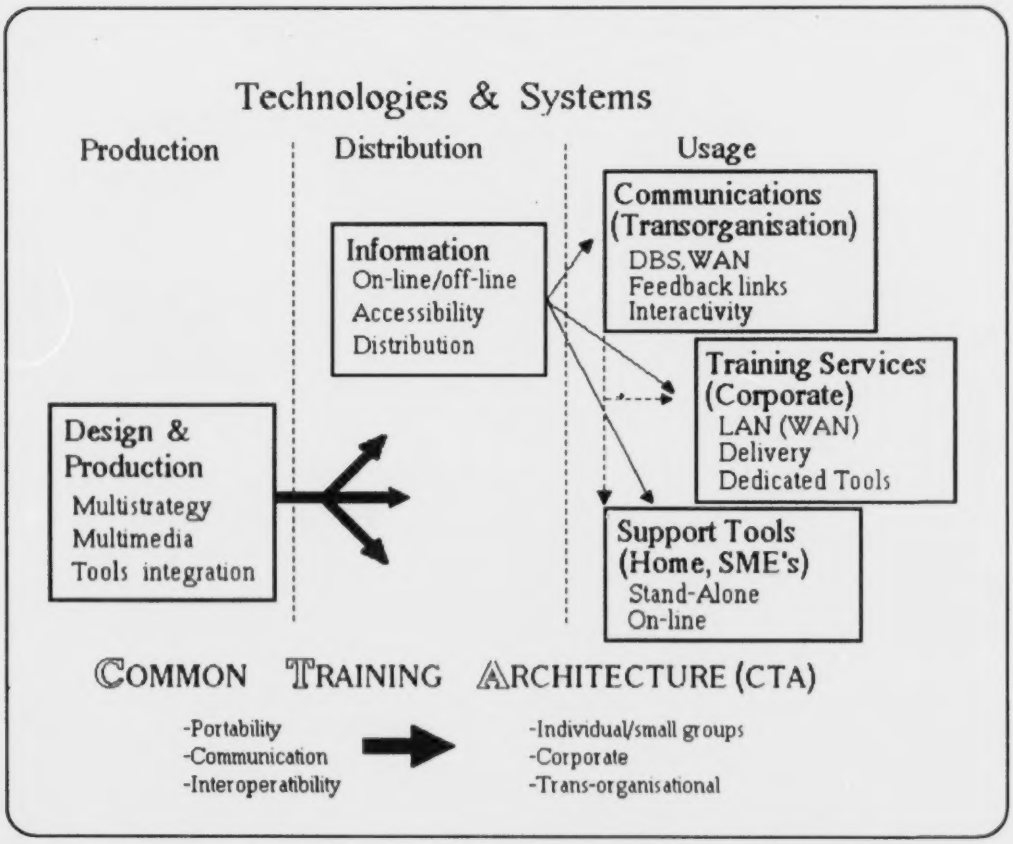
On top of the activities carried on by the Commission to reach the interested parties at European level, and the network of National Contact Points set up to channel the information at national level, it is worth noting that many other actions are undertaken by many other institutions and consortia to reach more specialised

audiences in order to make them aware of the results.

Several human networks will build on those advances, in the three directions of users, researchers and producers of telecommunications and computer based applications. The **SATURN** association, based on 80 companies and Universities using computer based training applications, will soon disseminate

INTERMAPS group has ensured a professional information coverage of all those initiatives, through its "DLT news" and magazines.

We have ensured links with all the other existing networks such as EADTU, EUROSTEP, EUROPACE or community actions such as COMETT , EUROTECNET and LINGUA.



examples of good practices based on a broad European network. The **ELTA** association, which has been supported through a DELTA project, has already demonstrated the interest of both the academic world and the industrial world in the research carried on in the DELTA area and expresses its involvement through this event. The STARTUP initiative has set up a network of 800 producers of technology based applications for learning. The

Learning Technologies in the new Framework Programme

The results of the Exploratory Action provide a solid foundation to undertake further work in this field, to continue the research on the most promising areas identified and to target further the goals of the next phase.

The principal question is what the future holds. The DELTA Exploratory Action takes place in the context of the second European Community's Framework Programme for research and technology development. The follow-up of this action will take place in the context of **the third Framework Programme.**

The priorities for the new Framework Programme derive from a general assessment of the challenges facing Europe. They have brought about the need to increase competitiveness, to improve the quality of life and to cope with the changing scientific environment. Therefore, the new research and technology development will increasingly be related to **meeting the socio-economic needs in the Community** and will do so through appropiate demostrations of the technical and economic feasibility of emerging technologies.

One of the chief concerns for the new Framework Programme is the future implementation of trans-European services and infrastructures. This is the key issue for the new Action Line 1-c "Telematics Systems in Areas of General Interest". One of the main goals is to pave the way via incremental R&D, for the implementation of these services in health care, transportation and education, amongst other areas.

R&D in Telematics Systems for Distance and Flexible Learning

The actions envisaged should facilitate future trans-European services for flexible and distance learning based on telematic infrastructures and should improve the access and performance of training in Europe.

The added value for the users that new technologies can bring about for meeting the challenge raised by the growing training needs in Europe is threefold:

Firstly and foremost, in terms of **flexibility**, making possible the adaptation to meet very different training needs, learners' patterns and didactic strategies (multistrategy) and settings, and media combinations (multimedia).

Secondly, in terms of **accessibility**, enabling remote or local access to training materials whenever and wherever required by the learners, putting at their disposal the know-how and the expertise wherever they exist.

Finally, an adequate service infrastructure providing an **optimum support to the users** - learners, trainers and course producers. This should encompass the different processes involved: information to trainers and trainees on educational resources avaible tailored to the specific needs, their delivery, the monitoring and tutoring of the learners and facilitating the access and usage of basic tools and materials required for the designers and producers.

Towards European infrastructures for Flexible and Distance Learning

I have addressed the potential advantages for the users of these services, but one should address as well the market factors involved, if these advantages are to be taken up. These market issues advise us to take a step forward towards the establishment of interoperable infrastructures conveying distance and flexible learning.

Networked training offers the long-term possibility of significant cost savings and widespread use of training services. The main factor for success is a long-term commitment to service infrastructures, standards, protocols, technological evolution, tariffs etc. coordinated European-wide. Although networked training is in its early stages, technologies and telecommunication networks are mature enough to both convey training applications and to meet the increasing demand for flexible learning services. Many organisations need to access training services and skills as and when they need it. This is particulary the case with SMEs. Nevertheless it is necessary to develop a clear market rationale and long term planinng in order to

promote investments leading to the establishmenent of infrastructures.

Evolution might be hindered by the use of incompatible systems. There is a risk of spreading too thinly the scarce resources for distance learning by developing competing schemes which later on will not have any significant impact on the market.

The potential advantages of a common infrastructure for telematic services in distance and flexible learning are as follows:

- Meeting the demand of flexible training
- Enabling the educational system to offer vocational training to adults at work
- Better economies of scaale
- Setting up an experimental environment (test-bed) in which trainers and technologists can pilot new techniques, as the telecomunication infrastructures and learner technology evolve.

The approach should neither be a top-down nor a technology-driven new infrastructure on top of the existing ones. Rather, it should be a basis to support existing networks in order to facilitate both interoperability amongst them and portability of the courses developed. It is essential for success to foster consensus building enabling the development of services based upon compatible technologies and standards. It should provide a user-oriented basis for the development of technologies and systems and a test-bed for future technologies. An evolutionary strategy should enable future extensions of the services provided, according to changing user needs and the emergence of new possibilities arising from the emerging technologies.

There has been a gap in the Community initiatives in Distance and Flexible Learning. There is R&D on infrastructures for ITT&B (RACE), there is an R&D Programme on new learning technologies (DELTA) and a programme for the development and delivery of training courses (COMETT). Now the time has arrived to prepare the emergence of a service infrastructure.

The follow up of the R&D in this field should, therefore, provide a framework for carrying out pilot tests related to feasibility studies for trans-European infrastructures. This would make possible the drawing-up of implementation plans for future services. Such plans of course depending on the outcome of these pilot experiments.

Main thrusts of R&D in Distance and Flexible Learning

Initial studies have identified three main thrusts of research in our specific field, telematic services for flexible and distance learning.

* **Strategies for the use of technologies, telematic systems and contribution to the definition of common functional specifications;** aiming at the development of strategies and scenarios required for the optimal implementation and usage of flexible and distance learning services.

* **Development of systems and technologies;** addressing the required technology for achieving a telematic service for distance education and training, which has to be flexible, efficient, modular and interpolarable.

* **Experiments on the validation and integration of services;** aimed at assessing the performance of the different services and technological configurations, the validation of technological and pedagogic adequateness and their related market issues.

In each of these directions, there is a clear need to take on board the work which has already been achieved in DELTA, exploiting their results, and to set up a close coordination with the relevant actions under other Community initiatives such as COMETT and EUROTECNET.

Identification of the required R&D tasks (Draft Workplan)

Directorate F carried out an exercise, in parallel with the DELTA Exploratory Action, aimed at identifying the strategies, requirements and tasks to be addressed in the future, a tasks' structure based on the above mentioned parts has been drawn-up and is described below.

Part I: Implementation Strategies

This part of the research deals with the strategies, potential scenarios, the definition of common functional specifications for the optimal implementation of distance and flexible learning services at trans-European level, and other accompanying actions of horizontal nature. It addresses the following issues:

The **Assessment and Evolution** which will provide a framework for common criteria in the launching, monitoring and assessment of the pilot experiments that will be carried out. It will address performance, market impact, cost factors, etc. This overall evaluation will provide a coherent model contributing to a better understanding of the relationship between changing learning needs and technologies and their market impact. This task will aim at the definition of **guidelines and methodologies** for an optimal use of technologies for the design, production and delivery of learning materials, fostering an improvement of their quality and enabling the exchange and transfer of products throughout Europe. The monitoring of the experiments undertaken within a coherent set of criteria will result in feedback which will allow the upgrading of the whole model. A sound educational technology research is an essential element in any implementation plan.

The **market analysis and implementation planning** will assess, on the basis of studies on the identification of the users' requirements and their matching to technologies, systems and services, the various potential scenarios for the implementation of large scale services. The research will be based upon the results of the pilot experiments.

These actions should be complemented by **awareness actions,** such as the establishment of human networks and dissemination of results, which will facilitate building a consensus with the main actors involved, an essential prerequisite for any future implementation plan of large scale trans-European services.

Part II: Technologies and Systems Development

This part aims to identify the key technologies and systems required, and, by adapting existing communications and information processing technologies to harness them for educational purposes. The main objective is to achieve interoperability and portability of learning materials and the definition of specific standards to fulfil the functionalities required by the users: tutors, producers and, mainly the learners. This will be pursued by the design, prototyping and testing of a **Common Training Architecture,** which will be carried out in a concerted manner.

There is a need for this technological development to be pedagogy-driven and, at the same time, it is necesary to involve the different categories of users in the definition of the standards just mentioned. Pilot testing of these configurations is also needed. In other words, real-life trials to ensure the final performance of any development, to validate the technology and the systems.

This work will encompass **information systems** which allow accessibility of learning materials on a European-wide scale, the **design and production systems** making possible joint courseware development, **training services** and **learner/ teacher support tools.** There is room for local (off-line) tools and for on-line services; both are essential ingredients of any distance and flexible learning service.

Finally within this part of the programme, research should be performed on different configurations of technologies facilitating interactivity at a distance via Direct Broadcasting Systems and other **advanced communications systems.** This will enable new advanced and innovative ways for delivery of training at a distance.

Part III: Pilot Testing

The real implementation of these services is beyond the scope of this R&D framework. Nevertheless, some pilot testing experiments should be undertaken in orden to build up scenarios and plans for implementation which are to be based upon the results of real-life trials. This is Part III of the R&D we are currently envisaging. These pilot experiments will address the main areas of **delivery, information** and **joint design and production** of courseware.

The assessment of the feasibility to set up a trans-European electronic infrastructure for distance and flexible learning will be one of the main goals of these experiments. They must set up a platform for the exchange of information on the technical standards, networks and protocols they are using. They will provide an implementation plan for large-scale services and will test the new technologies developed in Part II where possible. A market impact assessment, a validation of didactic approaches based upon different technological configurations applied in different settings and a cost analysis should be an integral part of these experiments.

The various experiments will undertake a market study in their specific domains, assessing the users' requirements and available resources. They will bring about implementation scenarios. These results, plus the concertation mechanisms put into force will contribute to the objectives of the tasks in Part I. They will do so by providing the field trials needed for the consolidation of an implementation plan.

The overall goal is that the research as a whole will bring about a sufficient market rationale, technologies and systems available and commitment of the actors to foster the investment needed to set up infrastructures in the future.

In conclusion, the matching of these experiments with an implementation framework will be a step forward for the implementation of European-wide networked training. The contrary approach would lead us to some isolated experiments which may succeed in finding a market niche, but would not mark a real advance for the Community as a whole.

Concluding remarks

There is a general awareness on the increasing demand for training and retraining in Europe. Studies on skill shortages, and demographic trends are confirming it. Skilled population is the main asset for the future performance and competitiveness of Europe, and essential for its welfare. But, traditional educational systems with traditional media are not able to meet this increasing demand for life-long vocational training. There is an increasing awareness at the same time on the potentialities of new flexible and distance training based upon new media, and many expectations on the real performance of these new systems to meet this demand.

Our vision of the requirements and objectives is related to **the impact of the Internal Market.** To realise this Market, we must work towards **new European qualifications.** Consequently, the nature of the market of training services will change in order to fit with those new qualifications. Several segments of this market will achieve the critical mass which, until now, they did not have. This is now justifying investments in tools for learning which were previously imposible.

Nevertheless, many barriers for innovation have been identified during the Exploratory Phase, and some recommendations at least to find partial

solutions to overcome them have being brought about. Telecommunications tariffs, regulatory issues, transferability of resources, cross-cultural problems, market fragmentation, are some of the issues to be tackled.

It has been made clear that technology as such is not enough, the avenues explored under DELTA show us that there is a need to focus on real users' needs, which brings about the need to set up close cooperation with other European Commission initiatives dealing with the users, such as Task Force of Human Resources, SMEs, Structural Policy, enabling the exploitation of the results of the research. The latter can be specially crucial for peripheral regions, rural areas, SMEs and other special needs groups. The research must assess tailored solutions to these populations, and thus their involvement in this research should be encouraged. Although this is a general concern for the whole framework programme, this is particulary applied to education and training.

There is a need to focus on new research and development leading to set up infrastructures, with a mid and long term view, to foster investments, so far hindered because of the lack of clear perspectives on lasting technological solutions, and at the same time to increase our practical knowledge through educational technology research based on sound state of the art pedagogical principles and validated in real settings.

Cooperation European-wide is a must, not only due to market related considerations, such as broadening the market or avoiding that our competitors penetrate in a so far weak market, but because of the necessity to provide a cultural/educational dimension to our post-92 future. Training delivery throughout Europe is already feasible, one should not forget that satellites and other technologies no longer have national borders. Furthermore the joint dissemination of training through these technologies provide us with an excellent tool to improve cohesion and share knowledge.

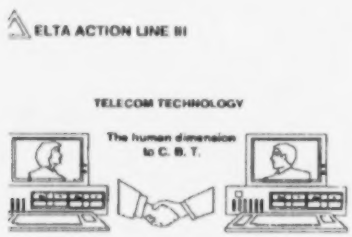
Joint efforts that have been undertaken by DELTA and other non-Commission initiatives, show the willingness of the players to cooperate at transnational level. They are aware of the joint responsibility to meet the challenge we are currently facing. It is not only a matter of technology and investments but also of research enabling us to identify how best these networks and technologies can convey training services, not only information. The ways to convert this information into knowledge is our main challenge.

Luis Rodriguez Roselló holds a degree in Telecommunications Engineering from the Universidad Politécnica de Madrid. He has worked at several Spanish institutions involved in the application of information technologies to education and training, namely the Institute of Technology in Education, the Ministry of Education and Science and CDTI (Centre for Technological and Industrial Development). In November 1989 he joined the DG-XIII of the Commission of the European Communities as Head of the DELTA Unit.

Jacques Babot
Action Line III Coordinator
DELTA Central Office
Commission of the European Communities

When I arrived at DELTA, just one year ago now, to take responsibility for the co-ordination of the telecommunications projects, that is to say, Action Line III, I could not have foreseen the diversity and creativity of its 7 projects .

Today, having studied the documents and followed the work over the last 12 months, I am proud to be a part of this process. I am confirmed in my opinion that Telecommunications technology adds a human dimension to CBT.



These projects touch on all aspects of telecommunications; the use of **DBS,** such as SATDOC and CHANNEL E and even CAPTIVE; the use of video-conference systems, wideband by OLEW and 2mbits by LAT and of course, the use of ISDN, or digital transmission in narrowband by OLE and JANUS.

DELTA ACTION LINE III
Exploratory Phase 1989-1991

Direct broadcasting satellite
- *CHANNEL E*
- *SATDOC*
- *CAPTIVE*

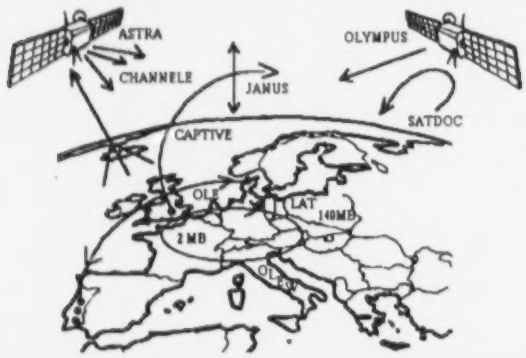
Video conference
- *OLEW*
- *LAT*

ISDN / Narrow band
- *OLE*
- *JANUS*

During this seminar, you will hear about the results obtained from each project, and you will also be able to see, fingers crossed, live demonstrations of their work.

OLYMPUS, ASTRA, EUTELSAT (with ECS2) the 2Mbits and 64Kbits links and even the good old telephone line, will be used for the different demonstrations.

The 2nd phase of DELTA, DELTA 91, will soon be launched with a call for proposals. The new draft workplan tries to orientate the future work through very precise task descriptions. As far as telecommunications is concerned the key word is ***interactivity***.



This famous human dimension is given to the technology through the links between terminal equipment; in reality, between the learner and the teacher.

The applications concerning the use of DBS will require an interactive option, for example, ISDN and computer conferencing. The R&D could be undertaken in the following fields: the use of ISDN from 64Kbits to 2Mbits, HDTV (for example, medical applications) and video compression techniques.

The use of wide band in local networks or wide area networks might also be studied.

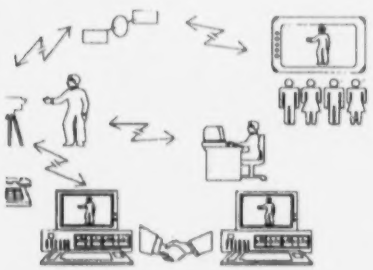
I believe that telecommunication technologies also offer solutions to the tasks in part 3 of the draft workplan.

DELTA 91
TELECOM APPLICATION

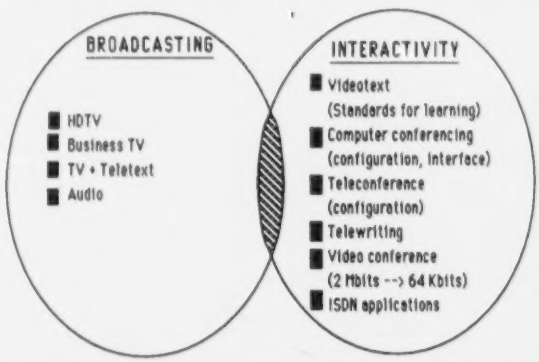
- *Networks configuration*
- *Direct broadcasting satellite+interactivity*
- *ISDN 64 Kbit —— 2 Mbit*
- *HDTV and compression techniques*
- *IBC + ATM*
- *Pilot experiment*
  - *Course delivery*
  - *course development*
  - *training resources*

These are the pilot experiments on a European scale in the area of "course delivery", "course development" and "access to remote training resources".

The land is full of networks and the sky is full of satellites (HISPASAT is already there). Technology has made great advances, but the future is still more promising. I look forward to your proposals for the next phase of DELTA.



TOOLS AND INTEGRATION



ADVANCED INTERACTIVE COMMUNICATION SYSTEMS

Jacques Babot was employed at France Telecom for 20 years. As a Senior Engineer he has worked in the field of transfer of telecommunication know-how for English and Spanish speaking developing countries. In January 1990 he joined the Commission of the European Communities as a Telecommunications Specialist in the DELTA Programme, in charge of the Action Line III projects.

EPOS: Building a Working Open Learning Service

Richard Walker
EPOS Project Leader
SIP

EPOS, the project for which I work, is part of the European DELTA Programme. DELTA is based upon two fundamental premises:

• that Europe's massively expanding training requirements can only be met through resort to Distance Learning

• that effective distance learning can best be achieved through intensive use of IT technology

The fundamental aim of the programme is to research the best possible way of applying IT technology to distance-learning.

EPOS shares DELTA's premises. Its aim however is somewhat different. The partners in the EPOS Consortium actually want to build a working Open Learning Service. What is more, they want the first components of this service to be in place very rapidly: by 1992 or early 1993 at the latest. This implies that EPOS will probably begin to operate before the pilot studies planned for the DELTA successor programme and certainly before any operational European distance-learning service. We are in fact already in the Bussiness Planning stage. DELTA participants will be able to learn from our successes - and failures.

Two strategies

The success of distance learning ultimately depends on its acceptance by users:- learners and those responsible for their training/education. In other words distance learning has to be marketed (even in circumstances where it is not sold for money).

Most people in this room believe in the strong potential of the TBT market. In 1990 total European expenditure on Education and Training amounted to 250 billion ECUs. Expenditure on Open Learning added up to 1.7 billion ECUs. It is obvious that if distance learning could absorb even a small percentage of this budget (say 1%) it would represent major business. In practice however the market for technology-based training is small, fragmented and lacks dynamism. There is a widespread perception among decision-makers that TBT products have failed to bring real benefits to users. The key question which has to be faced both by DELTA and by EPOS is how to realize the potential of the market - how to break out of the current stagnation.

At the risk of over-simplifying I would suggest there are only two possible strategies. These I will call the "Creationist" strategy and the "Evolutionary" strategy.

Let me be a little more clear. There are two basic ways in which it is possible to introduce an innovative new product or service. In the first approach you create a complete, radically new service from scratch (the creationist approach); in the second evolutionary approach you start with existing products, improve them, see if the improvements are acceptable, add furher improvements, again see if they are acceptable, and carry on this way.

It is possible to cite cases where the Creationist approach has worked: a typical instance is CD-Audio. There are however many other cases where the approach has NOT worked. Far too often products and services which have taken years and millions of dollars to design have proved to be unsellable. As

examples I could cite Concorde, 4-channel stereo, and a vast range of defunct IT products. The evolutionary approach on the other hand has a long and glorious history. Classical success stories are the Japanese invasion of the American and European automobile markets, or, closer to our own field, the approach adopted by all the more successful hardware and software manufacturers. An evolutionary approach minimizes risk; enables management to correct tactical errors; provides early return on investment. Technical solutions rejected by the market are discarded before excessive resources have been committed; management gains experience in marketing right from the start instead of waiting for the five or ten years neccessary to design and build a brand new product. In brief the evolutionary approach has massive advantages.

If DELTA's basic premises are correct distance learning is of strategic importance to the European economy. Europe cannot afford to fail in this field. In a much smaller way EPOS also cannot afford to fail. For both the choice of an evolutionary strategy seems a logical option.

If an evolutionary approach is adopted this poses an obvious question: how to start? This question has to be answered in both technological and non-technological terms.

Getting started: technology

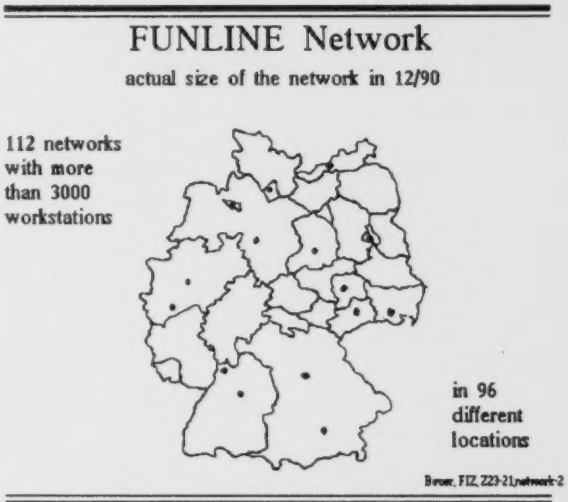
As far as technology is concerned an examination of what is available gives grounds for optimism. There exist a number of technologies which are already being effectively used in distance learning; other existing technologies - about which I will say more in a minute - could also be applied to distance learning with relatively little effort.

The oldest distance-learning technologies (apart from paper) are radio and television. Organizations like the British Open University have used this technology to bring highly effective distance learning to very significant numbers of learners.

In addition to these traditional technologies we should not forget classical TBT (primarily CBT and interactive video.) During business planning for EPOS we have identified a surprising number of large organizations using TBT for training. Many of these criticise the quality of TBT currently available; at the same time however there is a widespread belief within these organizations that TBT can contribute to improving the effectiveness and/or reducing the cost of training. I believe that these results are confirmed by the DELTA OSIRIS project.

One step beyond classical TBT is what one might call Distributed TBT i.e. TBT distributed across the telecommunications network.

Here too working systems already exist. As far as the EPOS partners are concerned both Deutsche Bundespost and SIP have large-scale working systems. The German **Funline** system currently has

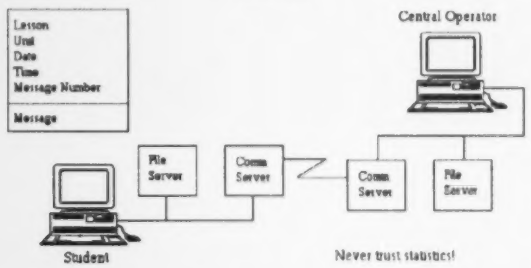

FUNLINE Network
actual size of the network in 12/90
112 networks with more than 3000 workstations
in 96 different locations

more than 3000 PCs used exclusively for internal training; the Italian **Fortel** involves just under 2000 PCs and is soon to be extended to include Macintoshes. In both cases feedback from training managers and users is very positive.

If we extend our examination beyond the field of TBT we can identify other technologies which can

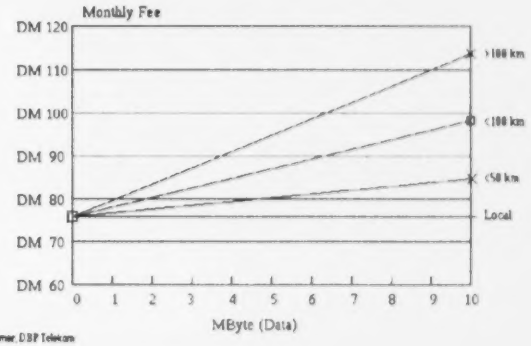
also be applied to distance learning. For several years now the scientific community has been making intensive use of electronic mailing and conferencing systems for its daily work. All that is required to apply this technology to the world of distance learning is some relatively simple development work to improve the user friendliness of existing academic systems. This means nothing more than achieving the quality of the best commercial products.

Mailbox



A further technology which can be inmediately applied to distance learning is narrow band ISDN. ISDN services are already available as a public service in a number of European countries (France and Germany, Britain, Switzerland, the Netherlands). By 1993 we should have the backbone of a pan-European network. Future ISDN tariffs will not be more than double those of existing telephone tariffs and in some cases may be the same as existing tariffs. Given that ISDN provides a data transmission rate of 64000 bits/second as opposed to current switched circuits which provide between 1200 and 9600 bits/second this implies a reduction of cost by a factor of a least 3 (if the tariff is double the current tariff and fast transmission is already possible) and may be as much as 50 (if the tariff is the same as the current tariff and maximum transmission speed is 1200 bps). For bulk transmission of data the comparison with the cost of transmission over the packet-switched network is even more favourable. The cost of ISDN hardware, which is currently an obstacle to the use of this technology, is also bound to fall rapidly over the coming five years. Thus, even without the more sophisticated services which ISDN offers (high quality sound, conference calls etc) we are about to see a revolution in the cost of transferring electronic material between different locations. This obviously affects what is considered feasible in terms of distance learning.

ISDN Fee (SO, 2B+D), 60% Efficiency



The availability of the technologies just listed implies that the application of technology to distance learning is not a dream for the future. It can be achieved today. Already with the technology we possess it is possible to distribute television, CBT and other forms of educational software to large numbers of users at ever lower costs; already we can provide mechanisms to give users access to human tutors and to support intensive, strongly motivating, interaction among users in different locations.

It is obvious that current technology has limitations. The preparation of high quality video material is very expensive; what is more this material leaves the user in a purely passive role; the quality of CBT and interactive video is often poor, though the products we now see in exhibitions are vastly superior to those available three or four years ago; telecommunications are expensive and slow. The list is endless.

Awareness of the weak points in our technology should not however be used as an alibi to do nothing.

If we adopt the evolutionary approach new technologies can be introduced on an incremental basis. The important thing is to get started; the technology to do this already exists. In reality however getting started is not primarily a technological problem.

Getting started: non-technological requirements

I have mentioned a number of technologies which can be applied to distance learning. Apart from ISDN, which is only just becoming available, the majority of these have existed for some time - though of course they are continually being improved. And yet, despite the fact that these technologies have been proved to work the effective application of technology to distance-learning is still the exception rather than the rule. Success stories like the Open University have been hard to duplicate. This implies that the obstacles to the spread of distance learning are in the first instance non-technological.

The removal of these obstacles does not require long academic analyses of the cultural, social and market barriers to distance education. The distance learning community already has a fairly clear notion of the nature of these barriers. What is needed is first and foremost practical action. In concrete terms this means the actual creation of distance learning services.

As I stated at the begining of this presentation EPOS is currently engaged in business planning for the creation of such a service. For obvious reasons I cannot go into the details of what we intend to do. These will be announced once our plans have been finalized and approved by the Public Network Operators participating in the project (there are currently seven partners and it is hoped to increase this number). I believe we will be able to make this announcement in the relatively near future.

What I can do, without going into confidential details, is discuss some of the general non-technological requirements for a pan-European distance learning service which have emerged from our planning work.

If an evolutionary strategy is adopted this implies that:

• the service requires a rapidly growing user base, capable of setting in motion the virtuous cycle of incremental innovation and user feedback, followed by further innovation.

• the service should be capable of assimilating and pushing technological innovation without becoming technology driven.

This has several implications

• in order to achieve a large user base the organization running the service must be organized in such a way as to "sell" it to potential customers. This would be just as true for a non-profit operation sponsored by governments or the EC as for a commercial venture.

• the service requires support from all parties whose interests are involved: major customers, the suppliers of educational material, hardware vendors, telecommunications operators

• the service must be organized in such a way as to cater for the enormous differences in the approach to education and training in different European countries.

• the service should have financial and political backing from companies and/or institutions willing to make a long-term investment.

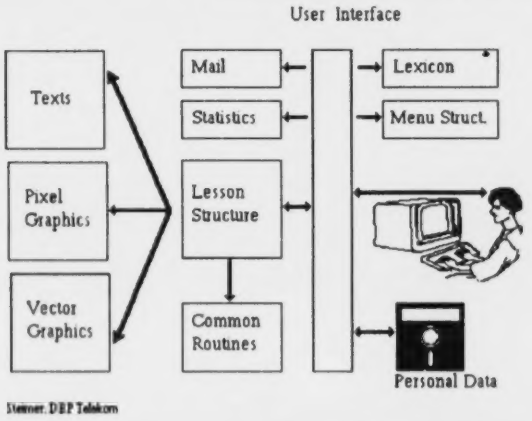
Conclusions

Within the EPOS project we are currently attempting to design a distance learning service which will meet the criteria of the evolutionary approach.

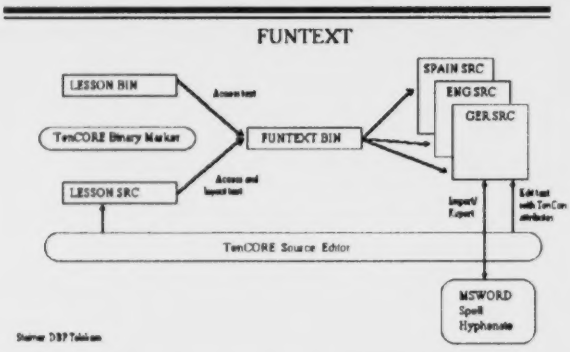
When the service is initially introduced it will inevitably be based on currently existing systems.

We are thus engaged in a detailed examination of the **Funline** and **Fortel** systems already operating in SIP and Deutsche Bundespost to see how far these meet market requirements and what useful improvements can be introduced in the short term.

FUNLINE Software Structure



In the meantime we are also taking a medium term view, examining the kind of service which it will be possible to introduce in two, three or four years time. This has in fact been the main thrust of our work within the DELTA program. Some of this work has taken the form of paper specifications. Certain key aspects are on the other hand being incorporated in an integrated "demo prototype",



based on currently available "high-end" software and hardware platforms: the sort of platforms which we believe will be widely available to users in the period 1993-95. This prototype will be demonstrated publicly during the second half of 1991. On the basis of the reactions of potential users it will be possible to design the service which will replace those currently being offered in Germany and Italy.

Meanwhile, and this is perhaps what distinguishes EPOS from other DELTA projects, great emphasis has been placed on practical business planning: organizational and logistical design, finance, marketing and so on. But that, as children's writers say, is another story which we hope to be able to tell you on another occasion.

***Richard Walker** holds a B.A in International Relations from Sussex University. He has worked in Italy for several years doing research in international economics for a private research institute and later teaching at Florence University. An interest in quantitative work led to professional involvement in computing. From 1984 to 1989 he worked for Sperry (later Unisys). During this period he designed and implemented DOCET, a CBT authoring language. He also developed a strong intellectual interest in non-orthodox aspects of computer science, in particular neural computing. In 1989 he joined SIP, the Italian national telecommunications operator, as the company's Project Leader for the EPOS project.*

Education via Satellite: Technology in the Boardroom and in the Classroom

Polly Rash
Space Systems/Loral

We live in a world where continuing education is a part of life. Today, hardly one country in the world has not embarked on some kind of distance learning, whether by post, telephone, computer, or satellite television.

Telecommunications based training takes many faces in the United States, and I am here today to discuss the satellite-delivered television learning that is taking place both in the classroom and in business offices.

Why Satellite Networks?

Satellite networks make sense for telecommunications based training and distance learning applications, because they are flexible, easy to install, are relatively inexpensive and permit an evolutionary educational system rather than a revolutionary change. Experiments on government-supported satellites in North America in the 1970s proved to both business and education that satellite television successfully delivers distance learning and corporate training to remote receive sites. Those early successful demonstrations led within a decade to dozens of corporate business television networks. Business uses distance learning quite successfully within the corporate setting.

Internationally, INTELSAT, the global satellite system which connects the world, donated space capacity for a series of highly successful demonstrations in telecommunications based learning by satellite through the award-winning Project SHARE. These transmissions showed that in all parts of the world, there is great interest in the use of interactive satellite distance learning. When INTELSAT conducted the Project SHARE experiments several years ago, its satellite capacity was primarily devoted to voice circuits. Today, INTELSAT has on order new, extremely powerful satellites which are optimized for television. These INTELSAT VII and INTELSAT VII A satellites are being built by Space Systems/Loral, the former Ford Aerospace Company.

Distance learning by satellite in the U.S. is growing at 20 per cent per year, based on the number of downlinks (Earth stations) installed. Hardware prices are lower every year, and in the past the space segment charges have been moderate. Descending prices and affordable transponder prices, along with successful early experimentation, made satellite-based distance learning in the United States a reality.

Business Television

A satellite based distance learning network is often called "business television" by corporations. The network can be described as a one-way audio satellite television transmission from a television studio uplink directly to multiple receive sites at business locations, or at schools. (Though called "business television," it is important to remember that good two-way is a vital component of satellite distance learning.)

With a satellite network, new services can be accommodated as they are developed. Networks can be expanded and changed quickly. Costs are relatively low compared with what other technologies offer.

Business television programs include corporate training and education, new product introductions, messages from headquarters to the field, motivational meetings, stockholder meetings and more. And yet business television users almost unanimously report that the most extensive use of their satellite video network is, of course, corporate education.

Business television was a US$200 million business last year. In North America, there are more than 80 corporate television networks now in operation, bringing education and training to hundreds of thousands of workers at more than 50,000 receive locations. While downlinks have increased 20 per cent per year recently, the programming has increased 10 per cent each year. There are networks programmed specifically for financial executives, automobile dealers, shoppers, lawyers, engineers, law enforcement, fire fighters, medical professionals, hospital administrators and others. At the same time that programming networks are being developed for a particular "family" of viewers such as financial or hospital executives, the number of networks owned and operated by corporations is increasing.

For example:

Ford Motor Company: a very successful network for employee communications and information

General Motor: a new dealer network with 9,700 sites

Hewlett-Packard: one of the first U.S. networks has expanded to Europe

IBM: three television channels to reach 216,000 US employees

Digital Equipment: an internal network for five years; now has added customer subscribers to the network to become a profit center at DEC bringing programs for information systems professionals directly to their workplace

Texas Instruments: provided a series of successful programs on artificial intelligence ("AI Means TI") to potential customers

J.C. Penney: a large American retailer with a network used by buyers to decide which merchandise to purchase for their stores.

Merrill Lynch: a network for employees who need to keep up with fast-breaking developments in the financial markets

U.S Postal Service: a US$14 million network that in five years will be used for telecommunications based training; this network will be used for education in all 73 postal divisions.

Radio Shack: a retailer of electronic goods with a training network at 200 of its stores

And smaller companies aren't left out. The Public Broadcasting Adult Learning Service brings information on law, taxes, and environmental issues to small businesses such as Jiffylube and Photomat.

Who are the network owners? Eighty per cent of the business television networks are owned by corporations, with the balance distributed among government agencies, religious organizations and other non-profit entities. Network sizes range from eight receive sites to several thousand.

Among corporate owners, manufacturing companies account for the greatest number of networks, especially those in the automobile, computer and other high tech products. The largest number of corporate receive sites, however, is currently in the retailing industry, which reflects the large number of retail outlets served and the presence of several large VSAT networks in the retail industry.

American business understands the need to train employees at low cost, and over long distances. Business television networks have provided the solution for many companies needing telecommunications based training.

Telecommunications and the Classroom

The situation for classroom education is, fortunately, at last catching up with business in terms of telecommunications based education. During the 1970s experiments, educators as well as business trainers were eagerly experimenting with satellite based distance learning. But when the experimental phase ended, and the free satellite time and other help went away, educators were not able to capitalize on what they had learned in the experimental days.

For much of the 1980s, there were few educational networks. Those interested in furthering distance learning were faced with several issues: lack of technological knowledge, fear of technology, the "I tried it once" syndrome, the "not invented here so it's no good" syndrome, lack of money to try new ideas and technologies, political overseers with little interest and less knowledge of how technology can help solve educational problems, few opportunities to compare competitive distance learning offerings, weak vision on the part of some educators, and lack of educators with technical knowledge to integrate distance learning options into school programs. But the picture isn't so bleak for satellite delivered distance learning to schools any more. Today there are many networks, much new interest on the part of educators and politicians, and new interest in the education market from hardware vendors. Now, technology has not only entered the classroom, it has become the classroom. The satellite dish is providing more learning opportunities to more people where they are located, instead of bringing them to the instructor, than we ever envisioned in the early experimental days.

Among the successful networks are TI-IN and Oklahoma State University. Both networks transmit two dozen different high school courses in math, science and foreign languages to 1,000 rural schools every day. Students see their teacher on a television screen and ask questions using a special talk-back system. Some of the rural schools equipped with satellite receive capacity are now being used as telecommunications training centers for adults in the community during the evenings and summers when schools are not usually open. Adults receive programs such as farm management, buying a personal computer, and much more.

The National Technological University offers television courses toward a master's degree in technical subjects. The NTU courses are received by dozens of corporations. A state network in Kentucky offers direct instruction to students. The US Congress has funded the Star Schools Program which allotted US$20 million to innovate telecommunications based learning systems. The program was recently funded for a second round.

Funding, commitment and quality programming are the keys to future success of telecommunications-based education and satellite-delivered distance learning. Professionals in the global satellite communications community should feel an obligation: To help get this technology, avaible today, into the mainstream of the educational process. The support of decision makers at the highest levels of national and regional educational policy is crucial. Without it, the promise of distance learning via satellite may be realized only in the corporate boardrooms of major companies around the world, and not in school classrooms.

Europe's Role and the Contribution of Olympus

How much will Europe be involved in satellite-based training? Ponder these points. There is DBS (direct broadcast satellite) capacity in Europe that far surpasses that of the U.S. DBS will help drive satellite training, because a high power satellite that is used with small, inexpensive antennas, is a natural for distance learning or telecommunications based training.

The Olympus satellite, launched in 1989, has been described as the world's largest and most powerful

civil three-axis stabilized communications satellite. This experimental satellite is demonstrating future communications capabilities on the European continent. Experience gained from Olympus will be used to develop telecom systems for the 21st century. High power in the satellite means smaller, flexible, less costly networks for training and education. With the European Space Agency allocating daily air time for education, the satellite is host to a range of projects likely to extend the boundaries of telecommunications based training in Europe. EUROSTEP (the European Association for the Use of Satellites for Training and Educational Programmes) has responsibility for some 3,000 hours of programming using the DBS European beam. I understand that at least 100 broadcasting members from 20 countries are experimenting on Olympus. This is very exciting to one who helped develop the first American experiments on ATS-6 and CTS/Hermes in the 1970s. I am following your progress with great interest from 3,000 miles away. With its powerful 30/20 GHz payload, Olympus can take the leap into the next century and show us what the future of telecommunications based training will be.

Conclusion

Communications satellites are our servants in space. They are creating a global Electronic Village that is in fact producing a "super tribal" community unlike any society known before. The breadth of applications for satellite-delivered distance learning and business television has not begun to be realized. When you consider the potential for delivering such a vast amount of information into homes, schools and businesses in Europe and the Americas, the limiting factor may well be our imagination, rather than the satellite delivery system.

Polly Rash, a prominent telecommunications executive, is Manager of International Business Development for Space Systems/Loral (formerly Ford Aerospace). She began her career in space communications in 1977 organizing satellite television training on NASA experimental satellites. Those experiments on NASA satellites were the beginning of today's video teleconferencing, distance learning and business television.

Polly Rash is a founder and currently Chairman of the Board of the Society of Satellite Professionals International, a worldwide organization of people in the satellite industry. She was inducted into the Teleconferencing Hall of Fame in 1989.

Corporate Training by Advanced Telecommunications

Friedrich von Stachelsky
Condat GmbH

Abstract

The paper considers a system design for distance leaarning employing audio-visual and data processing technologies. The functional requirements discussed are based mainly on exploratory research on video conference experiments and on the notion of the "virtual classroom". The paper begins with a brief survey of seven video conference experiments which were carried out with various groups of learners in Europe. The results of the exploratory research are summarized with regard to the functional requirements of a future learning system which uses advanced telecommunications sush as IBCN, ISDN and DBS. Special consideration is given to tutor-learner interactions as well as to collaborative approaches to corporate training.

Introduction

Increasing demands on the quality of products and services in commercial enterprises imply that suitably qualifield staff is of paramount importance for continued competitiveness. The range of "intelligent" products regularly being offered requires the application, dissemination and development of new technologies, which quicky lead to current technical know-how being made redundant. Thus, the necessity for company and in-house training in countries which have reached a high degree of technological development is immense and, according to the experts, will more than likely be maintained in the coming years.

New approaches to learning will be necessary to provide for future requirements in further training in order to guarantee effective support for learning and make use of new training tools. With the expansion of communications infrastructures and improvement in the performance to terminals, more applications are becoming available which allow restructuring for the whole process of knowledge development and dissemination.

The depth and complexity of modern teaching methods are considered in detail in the EC programme DELTA (Development of European Learning Through Technological Advance). A new area for technically supported company and in-house training will be interactive distance learning, which has been investigated in the DELTA project LAT (Learning by Advanced Telecommunications).

LAT is a joint project within the DELTA programme and is being carried out by CONDAT, BERLITZ and the EUROPEAN SCHOOL OF MANAGEMENT (EAP). Seven experiments with various groups of learners took place in different European countries in order to assess the technical support required for distance learning and to specify learner and tutor places.

The LAT project begins with the assumption that new communication systems in which video, audio and data processing equipment is combined are excellent media for distance learning. However, essential for this is a system design which is adapted to the specific requirements of students, teachers, type of course and the organization of the school.

LAT has therefore chosen an approach in which the specification of learner and teacher places is based on processing exploratory research (see figure 1). First of all, future applications of European Learning were studied. Video-conferencing experiments were performed to investigate which kind of technical

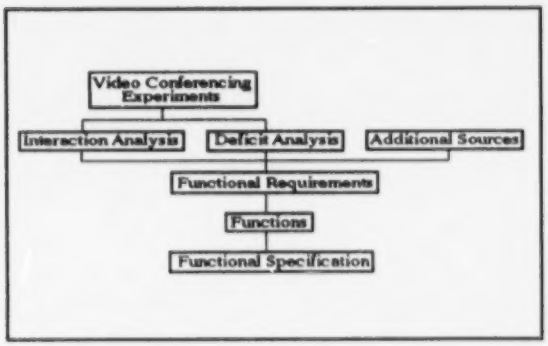


Figure 1. LAT Approach

support is needed for various learning applications in different environments, namely the Integrated Digital Services Network (ISDN), Direct Broadcasting Satellite (DBS) and the Integrated Broadband Communication Network (IBCN) (see Fig. 2)

The testbeds were 140 Mbit/sec and 2 Mbit/sec video-conferences connecting studios in different European countries.

Video Conference Experiments

Seven video conference experiments were proposed and carried out by the educational partners of the consortium. This user-oriented approach was chosen to ensure that the functional requirements and functions of learning systems refer primarily to existing courses and the actual needs of the educational institutions involved.

The seven video conferences may be categorized according tthe following communication objectives:

- VCs focusing on communication as a means of exchanging scientific and general information;
- VCs focusing on learning situations in a narrower sense;
- VCs focusing on communication and information in a more instructive sense.

The experiments were carried out in an explorative fashion. The heterogeneous composition of the experiments was deliberately aimed at a wide range of prerequisites, demands and learning situations.

However, the LAT experiments were unable to reflect all possible learning domains, due in particular to the limited number of courses and the explorative nature of the experiments. Nevertheless the requirements derived from the experiments are also likely to be found in other courses where skill training or cognitive learning objectives are the main concern.

Additional sources have been included in order to broaden the empirical and theoretical basis for the analysis of functional requirements. These sources include the concept of the virtual classroom, which plays an important role as a theoretical requirement. It postulates the type of technological support required in order that distance learning may reflect as many variations as possible of tutor/student interactions as occur in the normal classroom.

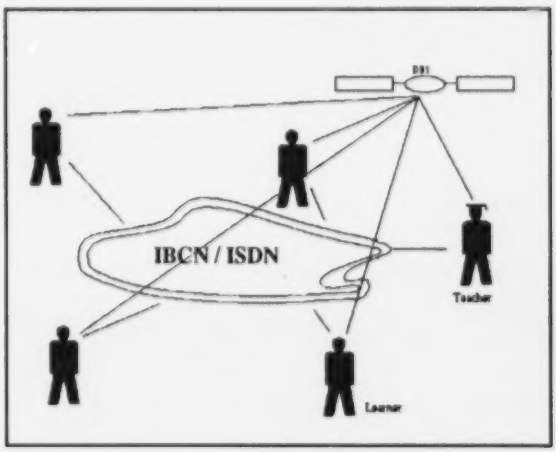


Figure 2

Experiments focusing on learning situations were of particular interest to the specification of learner places as they represented typical situations of skill training. Two experiments took place within the framework of

the seminar "Going International." The concept underlying this seminar was the combination of language training and cultural understanding on the basis of elaborated didactic guidelines.

Overall, the LAT language and management training experiments supported by video conferencing were quite successful. The experiments revealed that video conferences, if adapted to learner needs, are a most suitable medium for achieving pedagogic models, such as simulations, role-plays, and presentations.

Thus, the LAT project put to the test the kind of elements typical in synchronized distance learning programmes which are also inherent in the "Virtual Classroom": students and the trainer communicate simultaneously via audio and visual channels. The idea of the "Virtual Classroom", however, incorporates additional technical components which we were not able to take into consideration in our project. These components include asynchronous communication such as electronic mail and computer conferencing.

Futhermore, the experiments were quite useful in providing relevant inputs for the design work on learner and tutor places. All video conference experiments contributed to the functional requirements of learning systems which are summarized below.

Functional Requirements

The requirements concern themselves in the main with tutor and learner places.

1) The system should make speaking and listening complementary to rather than opposed to typing and reading. Both communication types should be available to the user.

2)The learner and tutor places should be multi-functional with regard to the technical environments (network interfaces) and the type of sessions concerned, thus enabling them to make use of DBS/ ISDN, B-ISDN and ISDN for distance learning.

3)Furthermore, the learning system must be flexible in two ways. Firstly, it must be capable of adopting new functions as well as allowing modification of existing ones according to changing tutor-learner needs. Secondly, each system must be able to combine the various transmission modes and make them available to a non-expert user in a consistent form.

4)The learning system should enable the tutor to select and set the network to be used - be it IBCN/ ISDN, DBS/ISDN or ISDN - at the start of each session, and the system should provide a similar facility to the learner.

Tutor and learner places permit various types of sessions, depending on the number of locations and networks employed, so that system design must take account of the following five types:

- two-party sessions via IBCN/ISDN
- multi-party sessions via IBCN/ISDN
- multi-party sessions via ISDN/DBS
- two-party sessions via ISDN
- multi-party sessions via ISDN.

5)The tutor should be able to send multi-media documents (MMD) in any form (i.e. text, voice, raw/ structured data, image and video) to all learners. Prefabricated as well as on-the-spot material will need to be transmitted with a minimum of effort on the part of the user.

Of particular relevance is a scribble system for the tutor so that, for example, students can see the tutor's hand-written notes on the screen. It should also be possible to display graphics remotely.

Furthermore, the system must provide suitable management tools to support tutor/student communication before and after sessions. Organizing sessions requires considerable effort and comprises interactions in the form of data/voice communication. Technical support for the preparatory phase should include access to the learner at any time for certain

types of sessions.

It is also obvious that certain types of sessions will require that tutor/learner places be capable of receiving MMD prior to or following the session, so that this facility must also be available. A dedicated terminal will be required to provide this "power on" facIlity; this terminal must be independent of the learner PCs, yet capable of being controlled by them.

6)Bilateral and multilateral interactions place additional and, at times, considerable demands on all learning system components.

In addition to the ability of the tutor to hear and see students at all times, the tutor may wish to distinguish between an individual student or group. The system must support this option as well as allowing individual students to contact the tutor at any time. In addition, it must be possible for other students to follow the conversation between the tutor and individual student.

Furthermore, it must be possible for the tutor to pass temporary control to any of the students.

7)Students at all locations should be able to transmit MMD (usually as single components) to the tutor and other students.

The system must be designed to take account of the skills of novices as well as advanced learners. Thus, it must provide, on the one hand, easy-to-use communication such as telephone and telefax, on the other hand, electronic mail for transferring documents.

In addition, it would be of great benefit to the learner to be provided with a number of entry facilities which could be selected according to need, including mouse, light pen, key pads and voice I/O devices.

8)As well as providing all the functions needed to support face-to face communication and document transfer, the system must also support all functions required for self-study by means of Computer Based Training (CBT).

In addition, courseware must be easy to transmit from the tutor to the student. An integral part of distance learning will comprise of the student performing tasks at his PC and sending the results to the tutor.

Screen contents at student work stations should be accessible to the tutor for the purpose of providing any assistance.

9)Finally, the learning system should be capable of supporting team work in the classroom or between learners at different locations, enabling work material to be exchanged between and displayed at other locations. In contrast to most group experiments, in distance learning advanced telecommunications can be used to extend collaborative learning beyond the classroom.

Future Learning Systems

In corporate training, future distance learning applications are conceived as a system consisting of a teaching centre and a number of learning centres at various locations (LAT classrooms) communicating with one another via IBCN, ISDN and, or DBS.

Such learning systems allow both direct teaching and individual tutoring and may include periods of unsupervised study. The system can be set up to enable the course participant to follow up a class with a CBT program, either at the workplace or in the classroom, and to receive any assistance necessary from the tutor. Providing the appropiate equipment is available, both direct teaching and tutoring the participant's workplace are feasible.

Asynchronous communication between tutor and course participant, or among participants, is possible through a suitable mailbox.

An extension of this learning system would permit course material to be stored in the database at a learning centre, which could be accessed by all

course participants. This would allow the participant to obtain information on various curricula and learning material or to choose from the material available.

The main features of the LAT classroom shown in figure 3, which would accommodate up to twelve learners, are as follows:

- classroom with two half-circle tables for 12 learners sharing 6PCs;
- hardware: 6 learner PCs and peripheral devices, 1 PC for terminal control, ISDN/IBCN/DBS interfaces, codecs, control units, 1 document camera, 2 room cameras, large display screen;
- peripheral devices for each learner PC: keyboard, mouse, light pen, scribble system, ISDN telephone; large screen for displaying documents;
- all PCs interlinked by ISDN;
- dedicated learner document unit with: high quality scanning, laser printing, convenience copying, telefax;
- learner/tutor interactions supported by flexible service systems.

Characteristic examples of technically supported tutor/learner dialogue are the transmission and explanation of exercises by the tutor, tutor supervision of such exercises and the availability of learning aids. Learning aids can take the form of electronic mail, transmission of handwritten notes, or a direct discussion between the remote tutor and participant.

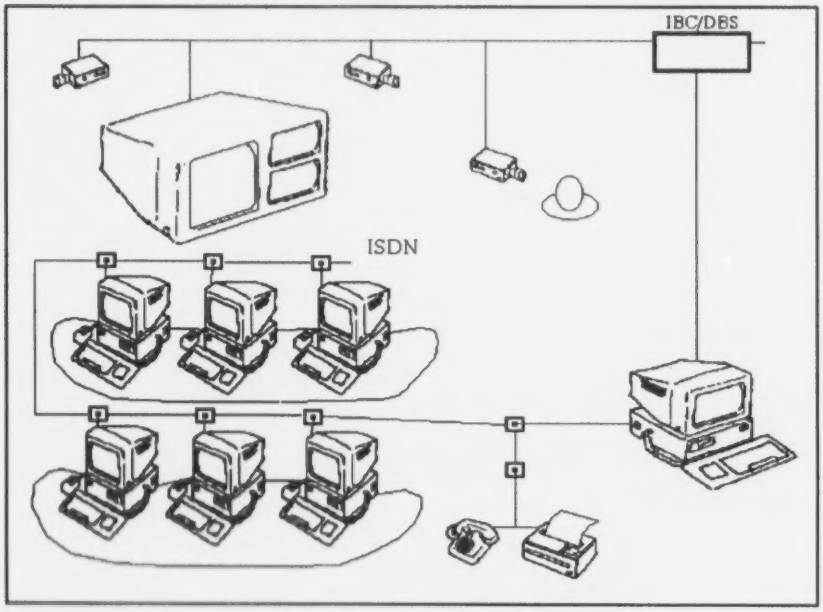


Figure 3

Friedrich von Stachelsky *studied physics at the RWTH Eachen, FU Berlin and the Imperial College of Science and Technology in London. He was an assistant in the Faculty of Physics of the FU Berlin and while there completed a second degree in social and business studies. From 1978 to 1988 he worked as assistant and project leader at the Heinrich-Hertz Institute for Communications Technology, during which period he spent a year at the VDI/VDE-Technology Centre for Information Technology researching the acceptability, technical analysis and evaluation of new information and communications systems. In April 1988 he joined the Berlin software house of CONDAT.*

The main areas of his work have been: acceptance of applications of modern information and communication, technologies (empirical research), users-oriented concepts for the configuration and specification concepts for B-ISDN applications, feasibility studies on IT&T applications including learning technologies, project management of the DELTA LAT-project.

Telecommunication Based Training, OLE Project

Mette Ringsted
Danish Technological Institute

Start

The OLE project was initiated following a number of reports published by the Danish Industry focusing on the following issues:

* increasing demand for further education
* need for flexible courses
* distance education solving growing needs for further education
* cross disciplinary training in industry implementing new production technology

As an answer to this the OLE project built a concept based upon:

Opening up the Classroom

timewise
Learning should take place whenever the user (=enterprise) wanted it

geographically
Learning should take place where the student was (i.e. on the job)

technically
Learning should be open to technology supporting the same basic possibilities in learning situations as in the classroom, group discussion, teacher presentation (blackboard, texts, drawings, two way dialogue, group communication, self study etc)

The OLE project borrowed the concept from NJIT (Roxanne Hiltz about the virtual classroom) and transfered it to a Multi Media Virtual Classroom.

"A communication and learning space situated in a multi media electronic network"

The OLE project wanted to:

EXPLORE

Multi media possibilities in an ISDN perspective, using existing technology to simulate future use in an on-the-job enviroment. Two-way dialogue.

DEVELOP

Prototype workstation:	*Network*
Slow Scan TV	2 Mbit switched netwk simulating ISDN
Tele Writer with special sound	X.25
PC-support System: Dbase Videodisc Hypertext On-line up-date and techn. support	X.25
Computer conference:	PSTN/X.28
Group communication	2 Mbit
Binary file transmission	
Soft keys	PSTN/X.28

including nw-setup (codecs, special sound, problems in Portugal with establishing 2Mbit/satellite link).

STABILIZE PROTOTYPE

Prototypes of the different parts of the system should run in a full scale environment several times to prove its worth (in periods over 2-3 months), and stable the performance of the system - even if they were prototypes. This would imply system development and test of computer conferencing system and PC-support system, and prototype building and testing of the picture phone.

NETWORK CONNECTIONS

The OLE project used 3 networks to establish the multi media link:
2Mbits, PSTN, and X.25.

The OLE project did not address specific satellite issues or problems, except from the fact that part of a two way 2 Mbit connection to Portugal from Denmark would include a satellite as a basic carrier (2 Mbit).

It was possible to establish this kind of connection via the EUTELSAT organisation between Aarhus and Lisbon, but due to lack of infrastructure and organisation in Portugal it was not possible to have a 2 Mbit connection between the down link in Lisbon and the ECCO factory site in Freira.

Alternatively it would be possible to have a receive-only disk in Freira, but that would have exceeded the project costs unreasonably.

The Olympus Satellite was a test-bed alternative, but with up/down link in Denmark and only down link in Portugal it did not represent the two way dialogue possibility we looked for. Furthermore there was no maintenance organisation, and the full scale nature of the project did not allow breakdowns or instability during the course period (3 months) and should at the same time pay attention to the strict preplanning of the distance education situation.

Finally we considered the EBIT network as a possibility, but probably due to an extended use of other networks in Race Pilots, there has not been sufficient pressure on the EBIT organisation to establish a switched 2 Mbit network in Portugal.

The conclusion (due to time pressure and money) would then be that readiness for maintenance and experiments are not consistent throughout Europe and we still have to face specific remote area problems in this phase of DELTA.

FULL SCALE TEST

in Denmark and Portugal.

SOME OF THE FINDINGS:

1. It's possible to make a full life cycle course production and course delivery in this multi media environment - both technically and pedagogically to a satisfactory degree. The Multi Media virtual classroom did actually function. It was possible to simulate the real classroom in the virtual classroom. Roles of the actors,(authors, teacher, learner) were changed though.

2. The combination of the computer conferencing system as non-simultaneous tool, and the slow scan TV as face to face tool, and the PC support system proved to be a good media mix covering pedagogical needs in the training courses.

3. It's very difficult to cross national and cultural boundaries in a direct teacher-learner two way situation. A mediating factor is often needed, like i.e. training of trainers to overcome lingistic, cultural and local problems. But knowledge and technology transfer works out well in these kinds of projects.

4. Implementation of concepts is technically possible in todays technology. A lot of possibilities arose during the project period technically speaking. It's now possible to build a workstation within this MM-concept in today's PC hw/sw environment. (see demo based on a Windows 3.0 platform).

Going from Full Scale To Large Scale...
...is not possible yet:

- Lack of electronic infrastructure
- Market and users are still not ready.

Problems:

I. Lack of consistent electronic infrastructure (insufficient market basis) in production/user environment:

• Still low level of implementation of IT in industry for educational purposes

• Access to IT differs in the user groups:
  - PC workstations
  - video tape recorders
  - video disc, CD-ROM, CDI, etc.
  - access to computer conferencing systems, E-mail
  - consistent software platforms, i.e. Windows 3

• Differing access to carrier network
  - ISDN possibilities, X.25, telephone nw, 2 Mbit
  - multi point communication

II. Organisational framework around course production and course delivery:

• No large scale production of course material (lack of flexibility, expensive course production)

• Trainer/author knowledge too poor (how to design, author, present, and plan flexible learning)
  - collaborative authoring
  - collaborative teaching

• Preparedness in organisations
  - institutional cooperation
  - enterprises as "schools" - on-the-job-training
  - coproduction with publishing companies

III. Cross cultural knowledge transfer

• Local/national training sites: knowledge about local SME needs

• Experts centres: knowledge about state of the art technological and other developments

• Knowledge transfer models
  - center-periphery knowledge transfer
  - cross national knowledge transfer
  - cross cultural knowledge transfer

Large Scale Concept:

Would imply:

Develop telecommunication based training:

From the Virtual Classroom to Virtual Educational System

Open of Course Production and - Delivery System

Timewise

continuous possibility of production/updating and retrieval (design) of material

Geographically

independent of time and place of actors

Technically

flexible multi media representation according to existing technology level and user demands

Collaborative

authoring and learning

HOW:
Testing different MODELS in full scale

I. Open Course Network

Courses - Material and Equipment

The OLE project - both conceptually and technically -points out/stresses the need for development and implementation of open standard systems with defined interfaces. An example would be at a technical (equipment) level, where multi media implies:

* Continuous different combinations of media according to software/hardware development (new media on the market)
* Renewal of equipment: New editions updated hardware
* Different levels of media in the different target groups:
  - 2 Mbit
  - slow scan
  - "live pictures"
  - ISDN still video
  - ISDN tele video
  - 2400 Baud computer conferencing with file transfer.

Open Course Network

Courses - Material and Equipment (Figure 1)

* A course can include one or more subjects
* A course subject can be part of one or more courses
* A course subject can be represented in one or more materials
* A course material can be part of one or more course subjects

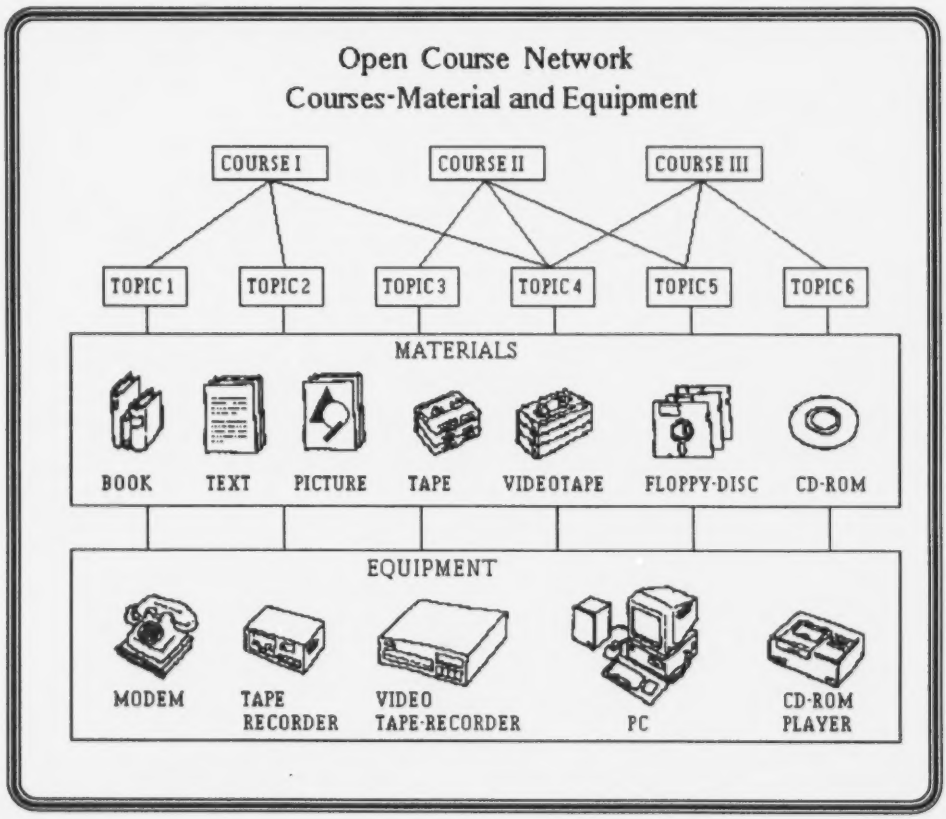


Figure 1

* Equipment can be used in connection with one or more course materials
* Equipment can be built together to different multi media.

II. Tailoring of Course Type

"Flexible Education" (Figure 2)

* Authoring process can take place in one institution/ publishing company or cross institutional/ministrial/ national
* Delivering of courses can be mediated by instructional designers, trainers/teachers, publishers or retrieved directly individually
* Development of equipment
* Need for an organisational framework/prototypes in branches, between organisations across nations.

III. PC as Communication Tool

Multi Media and Telecommunication (Figure 3)

* Development from todays technology to advanced broadband technology with various hw/sw platforms in a diversified market

Full scale experiments (dissemination and exploitation of OLE results)

A. 2 regional Danish projects:

* Djursland knowledge network - similar to the Portuguese
* ITAI (which you will be in contact with via the PC-phone) - problem of a direct two way communication

Addressing the following problems:

- educational institutional network as a mediating center between centers of excellence and end user students in SMEs

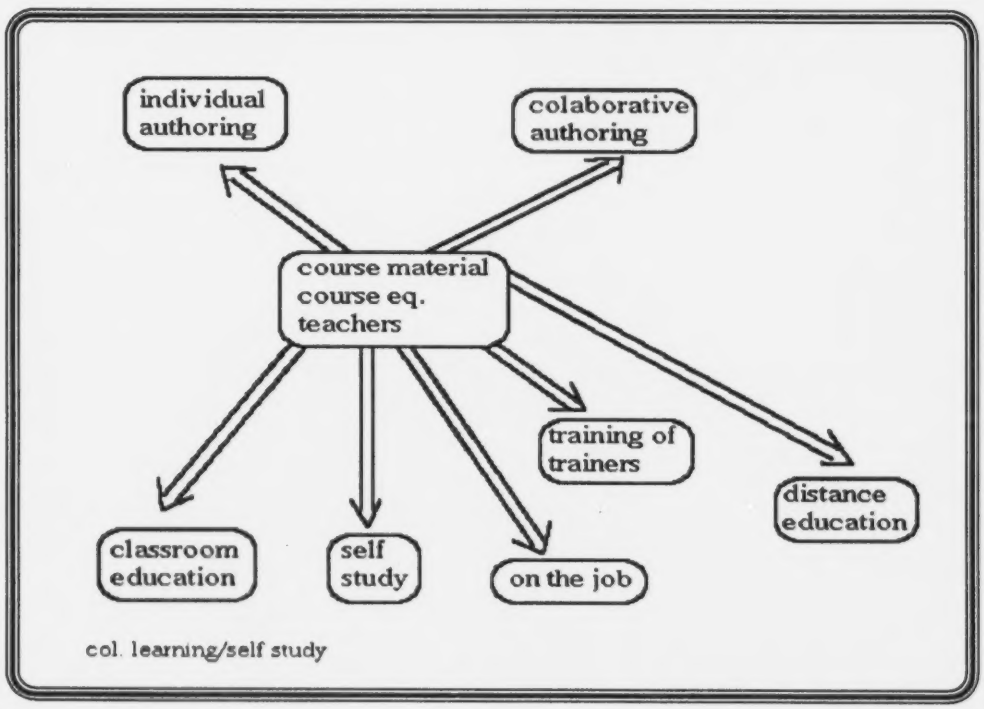


Figure 2

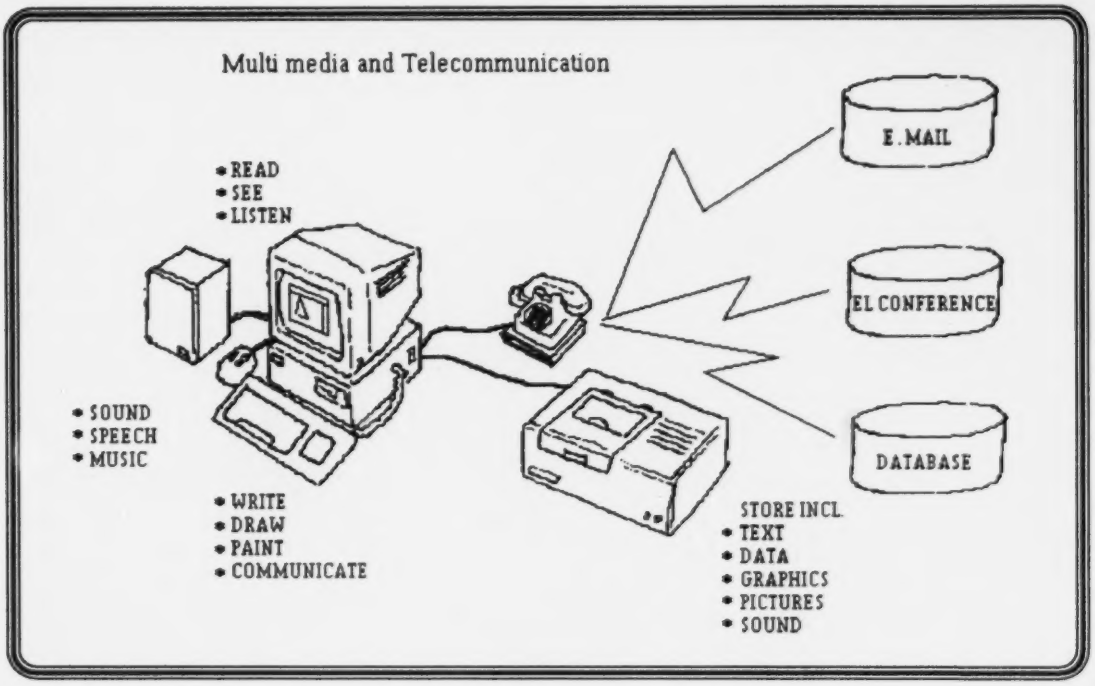


Figure 3

- Mediating center for SME's (ITAI)
- Knowledge transfer center - periphery (cf Portugal problems)
- SME network cooperation (SME innovation)
- teleconsultancy
- flexible learning
- cross institutional/ministerial and community boundaries
- electronic infrastructure supporting these activities

B. COMETT II Pilot "COSTEL"

Set up an organisational framework for collaborative European course production (classroom/flexible learning) and explore on organisational/electronic possibilities for framework for course delivery:

Problems adressing
- Course delivery system
  - technically (standards and level of technology)
  - organisationally (level of knowledge, flexible learning)
  - legislative (property rights, copy rights)
- Coordination of different open and flexible learning experiences in Europe
- Market issues
- Collaborative European authoring

C. Test of the technical aspects of the PC as communication tool:

in three projects:
- Production Technicians of the 90s
- Transport COMETT II Pilot Project
- COMETT II (Graphical Project (Desk Top)

Problems adressing:
- * level of technology awareness
  - teachers
  - students
- * authoring
- * hw/sw platform possibilities

* market

D.Future projects

• RACE: Development of IBC workstation for technical documentation
• DELTA: Course production/delivery full life cycle
• Eureka Picture phone for ISDN Jutland Telephone and others
• (Jessi) "Advanced chip-set for video phones".
• Lingua: Portuguese project with use of technology from OLE
• Portugal company: Ship building industry, CAD distance education with use of OLE concept and workstation.

***Mette Ringsted** holds the position of Research and Development Manager at the Danish Technological Institute of Computer Technology.*

The Open Laboratory for New Learning Approaches

Enrico Rovida
TEAM, srl

Continuous training as a support to organization and technology changes in the enterprises is today remarkably developed and growing at a very sustained rate.

This situation is partly due to a rapid obsolescence of technical and practical knowledge acquired during school training and partly connected to the enormous progress in basic research affecting all scientific disciplines with subsequent technology and production changes in industry and services.

An ever increasing number of company technicians, designers, production and maintenance managers, school teachers and researchers are devoting a considerable amount of their professional activies for updating, training and improvement of their knowledge and skills.

However, the unit cost of such training is very high due to the extreme variability of practical reqirements and the need for a custom-made training process. Innovative education methods are therefore required, capable of matching flexibility with high performance quality.

The integrated use of new information techniques may be helpful, since they considerably reduce the cost of information retrieval, transfer and storage and permit the creation of training courses designed to meet the specific practical and knowledge requirements of "adult" users.

This project aims at implementing an Open Learning Experimental Workshop (OLEW) of information technologies with the purpose of finalizing, experimenting and verifying some mutually interconnected information techniques for:

- adult training (permanent education)
- personal learning system
- capital intensive education techniques
- support mechanisms related to the continuous human resource development of an increasingly mobile skilled and professional related to European integration.

The workshop's main goal is the creation of a permanent meeting point for different operators (harware and educational software manufacturers, teachers etc.) coming even from geographically far away regions, with carefully selected users in view of a first experimental stage and the implementation of training packages based on an intensive use of advanced information technologies.

This project mainly meets the objectives of Action Line III of the DELTA programme.

Attention has been given to the finalization of a conceptual pedagogical reference frame (Action Line I) and the promotion of favourable conditions (Action Line V). (About this point, it is important to mention the connection between the OLEW project and the EETE project).

The methods to be followed for integrating all different technologies and different learning problems are schematically summarized by the workshop structure..

The matrix-like structure assigns differents tasks to those (technology oriented) persons who will be responsible for "technology categories" and to those (user oriented) persons responsible for specific usage types of these technologies.

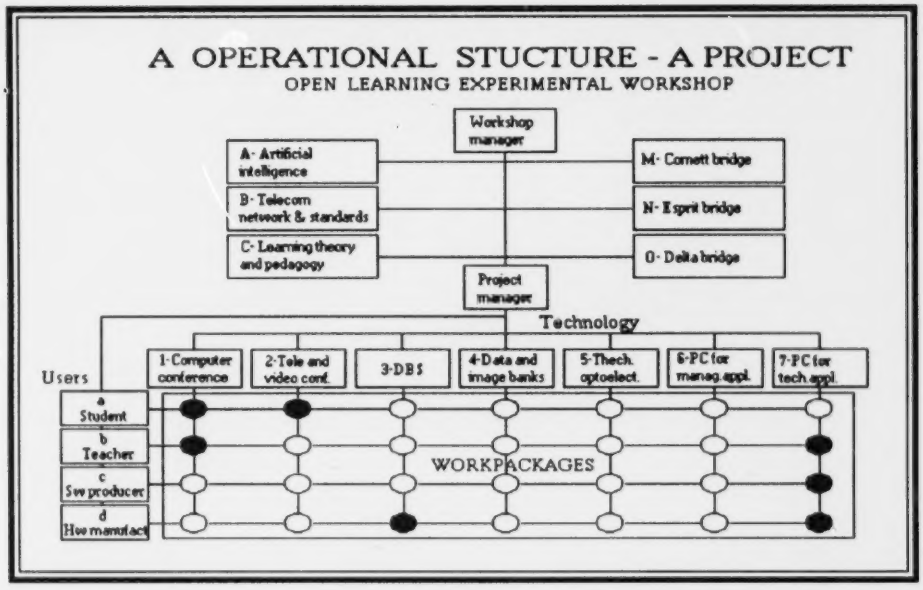


Figure 1 shows the organization structure of OLEW.

Expected results (output) will derive from a technology/requirement cross-over to be developed through a project method by which goals, resources, activities and results will be duly planned.

In the figure, technology categories are indicated with numbers, whereas user areas are coded by small letters. Each single activity is identified with a progression number.

The activities developed during the first phase of DELTA are marked as black points, the blank points are the activities developed by partners in the framework of OLEW but outside of DELTA.

Before looking at the activities developed in the DELTA programme, particular attention must be paid to the consortium partners. The real strengths of OLEW lie in the composition and the know-how of its partners:

AF Forum, a non-profit association useful because of the connection with large firms and research centres and its specific interest in developing new teaching methods.

CSEA (Consorzio Sviluppo Electtronica ed Automazione) consortium of PME and Municipality of Turin is a fully reliable partner thanks to its technical skills and implementation capability. CSEA has several information and educational equipment available since it runs courses on innovative technologies (i.e. CAD, CAM). CSEA's know-how and experience is useful from:

• the technology viewpoint, with reference to software and hardware products supplied by the enterprises belonging to the Consortium;

• the experimental education viewpoint, through the involvement of test student classes. DIBE (Dipartimento Ingegneria Biofisica ed Electtronica) University of Genoa contribution will thus guarantee consistency with some of the most advanced technology and educational research lines.

Danish Technological Institute with direct experience in training applied computer conferences is particulary important and useful.

Henley Management College has already acquired broad experience in remote-teaching methods, so Henley's experience has been integrated with this new action of validation of computer conference.

Centro Divulgator de l'informatica and *Chambre Régionale du Commerce et d'Industrie des Pays de la Loire* are the partners inside two different regional situations (Catalonia & Brittany): large and medium city, SME and large firms, traditional and technologically advanced industrial areas, so they are ideal partners for local experimentations and validations.

Last but not least *Team* as prime contractor has the general management of the project and a specific role of innovation management.

The OLEW project as the other action line III projects has the following main goal to reach during the Exploratory Phase of Delta (as reported in the Projects Overview report by the PRECISE consortium):

a) To analyze the integrated communications and operational organization support facilities requirements of European Learning in terms of the new terrestrial and satellite transmission capacity about to become available;

b) To ensure that these facilities can be effectively harnessed to the learning function.

The outcome of the projects in Action line III is expected "to specify the facilities which could serve the learning community of Europe" and "to prepare the introduction of a testbed for communication developments resulting from other DELTA Action Lines.

The underlying aim from the point of view of DELTA, as a whole, is to take full and early advances in telecommunications, in the interests of learning.

Inside this framework the OLEW project aims to test the main features of an open learning educational environment, although different technologies and aspects of the problems are tackled. The economic and pedagogical effectiveness of such a learning laboratory are again the main issues, and the target audience is the skilled and professional market with its needs for continual updating in new technologies.

The project is part of a five year plan to test a wide range of technologies and user classes: in this Exploratory Phase of Delta the essence of the OLEW project is to test the feasibility of a teaching laboratory using various new technologies.

Two media are tested: computer conference and videoconference with an analysis of the uptake and possible development of these media. The work was developed mainly by a structure based on a partner in charge of a test activity (i.e. computer conference Team videoconference AF Forum, multimedia lab CSEA) with the support of experts from different organizations for a cross-fertilisation of knowledge and skill.

On this occasion we are going to show as a result of our experimentation a video about the videoconference broadcasting on 4th October '90 and some methodological considerations by Dr. Andrea Palomba, Head of Research AF Forum.

Dr. Enrico Rovida, has held the position of president of Team srl since 1984. His interests lie in the fields of marketing strategy, management of technical change, and accounting.

IBM Distance Learning Developments Using Video-Conferencing

Barry Scott
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Abstract

Development of Distance Learning technologies is becoming a major interest for IBM Education in Europe, concentrated in three countries UK, Germany and France. This paper will outline briefly developments in the US, Germany and France, and concentrate on IBM UK's Education Television Network (ETVN). ETVN enables an instructor in a central location to teach students in remote locations via two-way video-conferencing links, combined with local area networks of IBM PS/2 workstations. ETVN has been in operation with 3 classrooms for over a year, and is being expanded to 6 classrooms. It is being used to deliver customer and internal technical education, plus other internal business support training. This paper will describe the development and use of the system and will be illustrated by a brief video showing the system in use.

Introduction

IBM, in the UK, France and Germany, is developing two-way video distance learning systems for training internal staff and customers.

We are doing this in order to increase instructor productivity, to reduce travel and lodging costs for customer and ourselves, and to make the best use of our specialist instructor skills.

US SATELLITE NETWORKS
ISEN (Customers)
CENET (Internal)

250 classrooms
15 transmit studios
≈ 80 K - 100 K student days
1-way video, 2-way audio
Multiple-choice keypads

One-way video teaching, via satellite, with an audio return path, is already in widespread use in IBM, in the US, Australia and Japan.

In France IBM is developing a 2-way video teaching system, based on 2 Mbit compressed video lines. It has been in operation during 1989, with a teaching studio in Paris, and six regional classrooms.

In Germany, IBM will install during 1991 one instructor's studio plus five remote classroom, connected at 140 Mbits, via optic fibre links.

A major difference between the system in Germany, and those in France and UK is that the central site in Germany will have students present in the same room as the instructor, in addition to students in the remote sites.

IBM UK's Education Television Network

In the UK we have been developing IBM'S Education TV Network (ETVN), since October 1988. It is based on 2-way compressed video over 384 Kbit lines, and

has significant IBM PS/2 control technology in its design. A separate 64 Kbit circuit is used for connection of the PS/2s.

EUROPEAN DEVELOPMENTS

IBM France
2 Mbit (PTT) service
Studio in Paris, 6 classrooms
(Lille, Lyon, Strasbourg, Nantes, Bordeaux, Marseille)

IBM Germany
1991. 1 studio + 5 classroom
140 Mbits

At the beginning of the project we defined the same major objectives we would evaluate:

* What kind of courses suit this medium
* What kind of training do instructors need
* How much conversion is required to take an existing course (with all its visuals) into this medium
* Is it necessary to have purpose-built classrooms
* Can a large system be controlled by one person
* What level of video quality (and hence line speed) is acceptable

UK FOCUS GROUP FEEDBACK

2-Way video
Practical courses

Implement:
Standard vid/conf kit
384 Kbit (+64 Kbit) lines
PS/2s on student desks

and, of course, the most important objective...

* Will the result be acceptable to customers and internal students.

ETVN Features

ETVN currently has an instructor's teaching studio in London, and classrooms in London, Portsmouth, Bristol, Croydon, Glasgow and Manchester.

Each classroom can accommodate 12 students, with 2 students sharing one PS/2. Each pair of students also share a microphone and are allocated one of the 6 classroom cameras. In addition there is a wide angle view of the classroom from a seventh camera.

The main features of the system are:

* The instructor controls the system through an IBM PS/2, using either a mouse or a touch-screen.

* Students indicate they have questions via their Keyboards, and the system attaches the location and name of the student, so the instructor knows to whom he's speaking, and can take questions in any order from a computer-managed queue. The student PS/2s are connected by Token Ring to each other, and can also access the IBM network for practical courses.

* The seven classroom cameras are selected, as are the microphones, by a local PS/2s which receives commands from the instructor's control PS/2 in response to a question being accepted by the instructor.

*Computer screens can be transmitted in both directions via the system during practical courses, enabling the instructor to demonstrate computer systems attached to IBM's internal network, and to view the students screens during practical exercises.

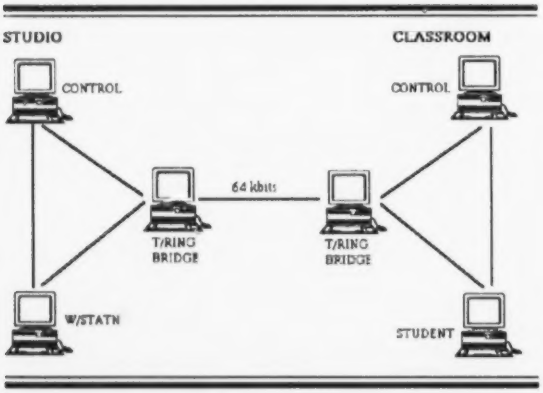
* Instructors' graphics can be transmitted directly to the students' PS/2 screens, as can multiple-choice questions. Graphics, in hard-copy form, can also be

displayed on the video screens, via 2 overhead cameras.

ETVN Courses

We have now run over 30 courses. The majority have been technical product courses, delivered both to customer and internal audiences. In addition we have a growing usage for the system for internal business support, product announcement workshops, training of IBM dealers etc.

The product courses, for example, cover various IBM operating systems, introduction to network concepts, and introduction to relational databases.



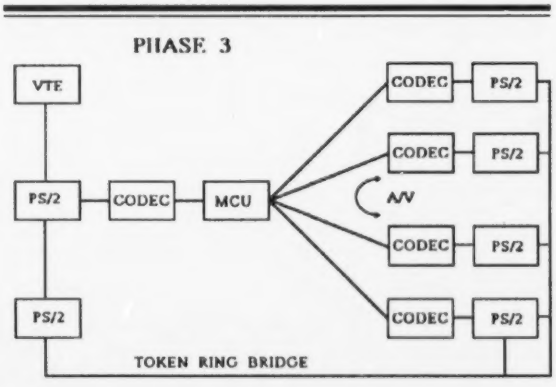
We have tried some experiments with more "syndicate" type workshops, and concluded, so far, that the medium is more suited to "hard" technically based product courses. To some extent the addition later this year of voice-activated video switching, enabling students in the various locations to see each other, wil help with other kinds of courses.

Course Materials

Students are given the same hard-copy course materials as for a normal class. A significant problem arises in the area of standard overhead transparencies. A typical 1-day technical course may have over 100 transparencies, many of them "portrait" (i.e taller than they are wide), not the "landscape" format of the screen. They are very frequently far too detailed to be suitable for TV display, and may be actual 80-column computer screen displays.

The initial courses run on ETVN required a significant re-design of most graphics material, in order to make it suitable for use with the overhead cameras and TV displays. This has lead us to develop the ability to capture the original foil, which is normally produced by a computer package, as a PS/2 bit-map image. This image, in the next release of ETVN, will be displayed on the students' PS/2 screens, under instructor control.

Another area affecting the design of courses is the need to make frequent use of multiple choice questions, via the students' PS/2s, in order to keep the students involved, and to check on their comprehension level. This is necessary because in spite of the two-way video, which is very effective in close-up situations, the instructor does not get the same degree of feedback from body language, particulary with a large audience.



Results

Reaction from students is encouraging.

Two important lessons were learned from the current results, and are being incorporated in current developments:

1. The need to improve the means of showing the instructor's workstation screen to the students, and vice-versa. The same mechanism is being developed now to display instructor's foils directly on the students' workstations.

2. The value of an intelligent, flexible control system that can be readily re-designed as we add function to the system and learn from our experience. The advantage of having the PS/2 front-end is already proving itself in this respect.

Conclusion

We have learned a great deal in the last two years, about the technology and areas of IBM training needs to which ETVN can be successfully applied, and we are continuing to learn with every phase of the project.

We have a significant programme of further developments is hand, and are looking forward to expanding the number of ETVN classrooms and available courses around the country.

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Jesús Rueda *was granted a degree in Civil Engineering in 1971 by the Universidad Politécnica de Madrid. In 1979 he began to work at IBM Madrid as an Advisory Scientist. He joined IBM La Hulpe in 1987, where he currently holds the position of Education Technology Projects Manager.*

Somewhere, over the rainbow... On satellites, distance education and EuroPACE

Soren Nipper
EuroPACE

I. Satellites and Distance Education in Europe

The use of satellites for distance education in Europe is in its infancy. There are still only very few operating European satellite projects which can be said to have educational affinity or objectives, even when broad criteria are applied.

Some corporate networks have seen the light of day during the last couple of years, with corporations originating in the US in the clear lead. In general, Business Television is an expanding industry in Europe, both when talking about one-off events and about corporate networks operated on a regular basis (ranging from daily to monthly programmes). Large and geographically dispersed corporations seem to be attracted by the effectiveness of this type of corporate communication. The corporate satellite networks obviously do programming that occasionally move into grey-zones, where 'company information' often borders to (product and/or customer related) staff-training objectives.

However, only a small handful of satellite projects qualify as educational in a stricter sense.

To this group I would count projects such as the Computer Channel which was operated by BSB. It apparently has gone down in the turbulence following the BSB-Sky merger in Fall 1990. (Another 'Computer Channel' project, however, still seems to be alive in France.) Scandinavian and French projects have tried to apply satellites to post-graduate education of doctors, but they either did not take off or they have been closed down again fairly quickly.

Many other projects, such as the one announced by the Amsterdam-based European branch of James Martin Ass., seem to be on the drawing board.

An example of a successful corporate network is the EDVN which is the European branch of Digital Equipment Corporation's Video Network. EDVN is expanding very quickly and is used for corporate communication, but also for programmes with a clearly defined educational focus. EDVN aims at three types of training within Digital: Self-training, Technical training and Skills training.

Channel e (on the ASTRA-1A satellite) and Eurostep (on the OLYMPUS satellite) are some of the very few non-industry initiated educational satellite projects. Both are experimental, as are the current educational programmes that are provided by the Italian Raisat project on the Olympus satellite. The Polytechnic South West in England is also using OLYMPUS for its STAR-NET project, a government sponsored training programme aimed at industry.

Yes, educational satellite is a completely new venture in Europe, and many projects are fighting all the classical problems facing educational innovations. The up-front investments are considerable, market awareness and adoption develop slowly, and public funding is often limited in time and volume. There's nothing particularly unusual in that.

We are subsequently still working from a limited European platform of experience. Our understanding of the particular educational and organizational influence of satellites on distance education is

obviously under development. We should be careful not to jump to conclusions, and we should allow ourselves the necessary space and time (= money) to build up the basic experience and to do the necessary experimentation. I am, though, strongly convinced that the satellites, where applied, potentially can impact and shift some concepts otherwise firmly institutionalized in our Golden Book of Good Practice in European Distance Education. On the other hand, that's how I feel about all telecommunications based media.

A satellite is more than a relay for educational television, just as a video cassette is more than a container. There are specific differences in functionalities and media characteristics, and you can decide to accentuate one or more of these functionalities, according to your educational objectives and your pedagogical approach: The choice of media for distance education is a pedagogical and organizational choice with social and organizational impacts going beyond the logistics and mechanics of delivery.

In this paper I would like to take up a few of these issues, as seen from the experience of EuroPACE, the satellite-based European Programme for Advanced Continuing Education.

II. EuroPACE: History and rationale

Who are the users, where are they, what do they want? These are probably the most important questions to be answered in any distance education programme.

In the case of EuroPACE, many of the answers were given a priori: EuroPACE was initiated, planned and implemented by its users. EuroPACE is simply driven and run by its member-organizations. In this and other respects it is unique in European distance education.

EuroPACE was founded in 1987 by 12 European industrial and academic organizations: British Telecom, Bull, DEUS, Digital Equipment, Fundesco-Telefonica, Fundetec, Hewlett-Packard, IBM, IRI, Philips and Thomson were the founding members of EuroPACE. They were actively supported by CRE (The European Rectors' Conference) and SEFI (The European Society for Engineering Education), and the Commission of the European Communities has been represented in the EuroPACE Board of Trustees since the very start.

Today more than 60 industrial and academic organizations have joined the programme.

Although EuroPACE was initiated by industry, it has always been and still is based on a cooperation between industry and higher education in Europe. This type of cross-sectoral cooperation has a young history in this part of the world, as compared with e.g. North America. It was still quite unusual in European continuing education, when EuroPACE started 3 years ago. It is, though, a general trend in Europe, not least promoted and encouraged through the Communities' R&D Framework Programme and other Community Programmes such as COMETT.

EuroPACE develops and delivers advanced continuing education programmes. The target group is European company professionals and managers as well as university staff and post-graduate students. 6 subject areas are addressed:

- Artificial Intelligence/Expert Systems
- Software Engineering
- Advanced Manufacturing Technologies
- Telecommunications
- Microelectronics
- Technology Management

A new subject area, Information Systems Management, will be added to our programme as from the 1991-92 Academic Year.

EuroPACE's objectives are pragmatic and tangible, and they reflect very tangible requirements:

European industry needs enhanced, faster and more cost-effective access to leading-edge information. European industry needs to disseminate this information to growing segments of its population of professionals and managers. European industry needs to provide access to quality education in leading edge technologies, technology trends and research findings to more employees and on a more continous basis than ever before.

However, the leading expertise is scarce, in high demand, subsequently difficult to get access to - and expensive.

EuroPACE has been set up in order to improve and broaden its members' access to this expertise - and to reduce access costs. Further, EuroPACE should work upbeat and it should develop and refine methods to bypass standard delays in development and implementation of continuing education programmes. It should apply a method for continous updates and revisions. But foremost: EuroPACE acts upon demand. Its offerings must reflect the needs of its users.

The objectives and the rationale of EuroPACE can be summarized as follows:

- To identify users' needs & requirements
- To give access to the internationally leading subject experts
- To reduce educational overheads costs (travel, accomodation, away-from-office-time etc.)
- To reduce development and delivery lead-time
- To speed-up response to user-needs
- To target programming and act upon demand
- To provide flexibility in time, place and pace

These objectives were best met through distance education methods. However, more important is that they can only be met by building EuroPACE's activities on dynamic organizational and human networking.

II.2. The EuroPACE network: facts and figures

EuroPACE's first experimental programmes were broadcast in Spring 1988. Now more than 700 hours of programmes have been developed and broadcast. We are currently producing close to 300 hours of new programmes during the Academic Year.

Programmes range from 2 to +300 hours in duration and are normally transmitted in modules of 2 hours per week. The main part are studio recordings, but some programmes are on-location reportages from European and international technology events. Short live seminars, called the EuroPACE Open Forum, of 2-3 hours' duration are organized regularly and at least once per month.

The EuroPACE programmes are currently received at +160 industrial and academic locations (Receiving Sites) in 16 European countries. We expect that the network will comprise +200 sites in 1991-92. Some 20 Receiving Sites operate as regional re-distribution and support nodes through which SMEs can gain access to EuroPACE's programmes.

The Receiving Sites are the backbone in a human and organizational network, or rather: a cluster of networks, that carries the development and implementation of EuroPACE's programmes. This network is EuroPACE's biggest asset.

At present it comprises +400 persons from all over Europe, and it is growing every day. The network includes programme advisors from the member organizations, subject experts giving the programmes, our video producers, the Receiving Site Managers etc. It is a geographically highly distributed and truly trans-European network. It is a trans-corporate, trans-sectoral, trans-cultural and multi-lingual human network. EuroPACE's main task - and challenge - is

to respond to the input and feedback from these networks (1).

II.3. The EuroPACE networks: media and technologies

EuroPACE's programmes are based on a mix of different technologies and media.

EuroPACE's number-one priority is to deliver quality continuing education programmes to a trans-European and trans-organizational user-group, for a reasonable price. This has called for unsophisticated and pragmatic approaches to the technical infrastructures:

The systems implemented had to be commercially available, financially feasible, de-bugged, non-proprietary, and it should ensure full European coverage and access. Operational management of end-user equipment should as far as possible be reduced to switch-on/switch-off routines. We have not yet met the latter target completely, cf. below, but we've come a long way.

However, as our priorities are on educational quality and relevance, rather than on technological sophistication, the media-mix and the overall architechture of our delivery and communication systems must correspond to and support EuroPACE's basic educational and pedagogical concepts.

The Thesearus/Spell Checker on my wordprocessor (none mentioned, none forgotten) defines a concept as "that which exists in the mind as the product of careful mental activity". I am charmed by this definition, and if engaged and heated discussions count as 'careful mental activity', EuroPACE certainly can claim to have generated some strong concepts, or 'products'. It may, however, be more straightforward:

EuroPACE's educational and pedagogical concepts simply reflect the major dictum's in European educational thinking and tradition: Education is dialogue. It is a two- or many-way process. It is teaching and it is learning, and both should integrate/impact each other, as they do in all good education. This is old stuff and trivia, and it has been repeated in the discussions about distance education over the last decade or so. EuroPACE builds on these discussions, and we have imported them into our own developments and experiments.

So, while we cannot and do not claim that the single network components are state-of-the-art technology, and most certainly are not as versatile as some of those applied to other satellite programmes, the way in which they are tied together reflects quite ambitious targets as to the educational processes taking place within the network.

We use satellites for delivery of television programmes, surface mail for delivery of printed material, and computer conferencing, phones and faxes for communication and feedback.

One of the Eutelsat I satellites is currently used for one-way broadcasts of the television programmes. Transmissions are in PAL, they are in clear, and so far with only one language at a time. We are planning an experiment with a multi-language programme in Spring semester 1991. EuroPACE will switch to encrypted transmissions, with multi-language and data channels embedded, as soon as technically reliable, financially feasible and easily operated transmission standards, systems and services have been clearly identified. The choice between

(1) For a more detailed description of the complexity of the EuroPACE networks, and of the processes that take place within and between the networks, see my paper: *"Developing Acceptance. The Use of Integrated Systems for Industry-Oriented Distance Education & Training"*, in: Proceedings from the Workshop on "Telematic Networks for Distance Education and Training - 'Electronic Universities'" (Brussels, October 3 1990. Workshop organized by the DELTA Unit, DGXIII/F, in cooperation with Task Force Human Resources, Education, Training and Youth, DGV). Above fact-sheet is copied, with due updates, from mentioned paper. Re-cycling is great.

transmission/encryption standards will be based on parameters such as: long-term lifetime, versatile functionality, and commercial availability of multi-standard receiving equipment with European-wide after-sale support.

Why do we use satellites and not video-cassettes? Firstly, it is a delivery technique that almost instantly becomes cheaper than reproducing, storing and mailing cassettes. The latter technique implies large overhead costs on staff and materials. From a delivery-costs' point-of-view, satellites out-competes cassettes surprisingly quickly. Secondly, it is a much more reliable delivery technique than surface mail. Cassettes have a tendency to get lost on their way to the receiver. Replacement/backup is much faster with satellites, if/when you have a drop-out on a transmission - as we of course have had in EuroPACE. Thirdly, satellites provide immediate and synchronized delivery.

Fourthly, the satellite is a demographically very democratic technology. Optical fibre networks and B-ISDN networks may represent a future threat to the strong position satellites occupy today. However, it will take many years before these advanced terrestrial networks will reach out to the European peripheries, if ever. The currently most significant trade-offs in European educational satellite broadcasting comes from the regulatory and bureaucratic nonsense that is applied to the administration of the 'birds'.

Finally, the satellite is - potentially - a unique educational medium by making possible something otherwise difficult to achieve in distance education for large groups: Presence and synchronization. Whereas this potential up to now only has been exploited on a very limited scale in Europe (for financial and regulatory reasons), it is clearly a key concept in satellite based distance education in other parts of the world, not least in the USA. I will come back to this later. Only this one remark at this stage:

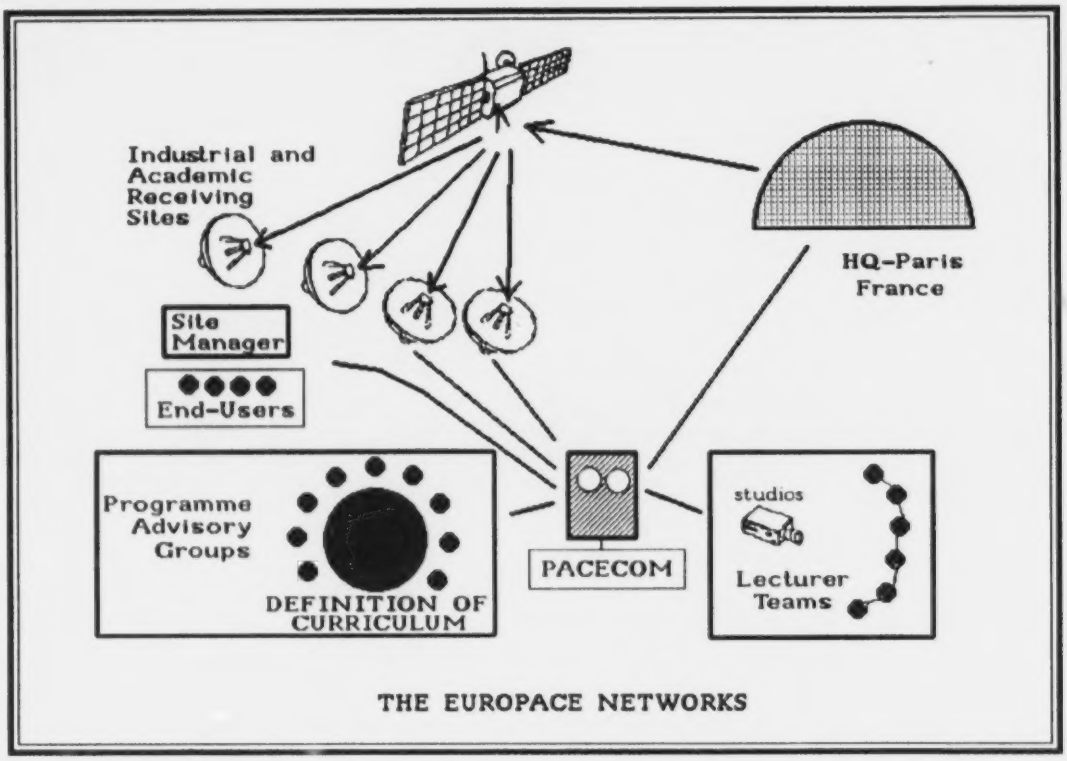
I am convinced that the choice between the synchronous and the asynchronous use of the satellites has fundamental consequences for the way the television medium is used. Not least will it have profound impact on the users' attitudes towards the television medium. The learning processes, the interaction and dialogue-formats develop in very different directions depending on this choice.

The EuroPACE satellite broadcasts are complemented by a variety of formats and fora for interactivity and feedback, from local classes and peer-groups to computer-mediated communication.

EuroPACE operates a computer-mediated mail/conferencing and document-library service, called PACECOM. It is an online service that can be accessed by any terminal type (from ANSI and upwards) and from any workstation, either through local in-house systems with X.25 gateways, or by direct terminal access to X.25, or simple dial-up connections. The specific software (PortaCOM (TM)) belongs to the large family of 2nd generation mail/conferencing systems that were developed in the late '70s and early '80s. The design philosophy is that of group-oriented communication in a multi-standard terminal environment. If you want to support in principle all terminal standards, including proprietary terminal standards, the trade-offs are for instance line-oriented user-interfaces and command-driven editors. Such niceties are not thought much of these days. PACECOM is also to a limited degree used for electronic transfer of documents.

The assumption was that PACECOM would enable EuroPACE to close the classical communication gaps in distance education: The communication between teachers and learners, and the communication among the learners themselves. PACECOM has been seen as the means whereby the isolation of the distance learner can be broken. It seems as if the problem is the other way around. I will come back to that.

EuroPACE is based on a media and network architecture that provides the means for distributing



THE EUROPACE NETWORKS

learning material to large, geographically and organisationally dispersed groups, while at the same time interconnecting the loops between users and providers. Fig. 1 offers a simplified illustration of these loops: Curriculum definition by user-representatives, teachers, studios, EuroPACE staff, Site Managers and end-users:

EuroPACE is user-driven and can only develop through iterative processes where users provide feedback on the quality, relevance and pedagogical design of the programmes. Strong and useful feedback have been given by the users, and requirements have been stated. I know of no other European distance education programme where this process has been as dynamic as in EuroPACE. I will shortly look at some of the issues that have been brought up by the users. I should, however, emphasize that the following remarks only cover my personal understanding of and view on these issues.

III. Satellites and on-the job education

I should probably also emphasize that EuroPACE's experience is reflecting the special requirements of a workplace oriented continuing education environment. Our experience may probably not be directly applicable to other areas of adult education, eg those covered by the distance teaching universities in Europe.

One of the key issues in on-the-job education is obviously that of time, place and space: When, where and how does the learner work with the learning material? During work-hours, at home, on an individual basis, in classes, in groups, with or without

access to a tutor or local resource person, spread over a longer period or packaged in 1-2-3 days full-time sessions? In the case of EuroPACE, the answer is yes!
Our member organizations have developed and applied a variety of different approaches to the local implementation and individual use of our programmes, responding to local educational cultures
and management policies.

III.1. Flexibility vs. priorities

EuroPACE normally transmits its programmes in weekly 2 hour modules, the idea being that this provides optimum flexibility and the best possible integration of work and learning activities. However, the question is if the trade-offs for flexibility are weak learning-priorities vis-a-vis the work priorities? Learning priorities will always have to compete with work priorities in an on-the-job educational setting. It seems that the former stands a better chance in group/class-oriented learner environment, and in the case where more modules are packaged into scheduled fulltime sessions. A video cassette on the shelf is forever patient and does not raise its voice. It risks to gain little visibility and attentiveness in the busy life of an enginnering professional or technical manager.

Flexible learning methods therefore presupposes inflexible management policies. Or as a representative of one of EuroPACE's member organizations phrased it: Flexible learning should take place in a controlled environment.

It is much easier for a large organization to define and install training and education priorities than it is for a small organization. EuroPACE users coming from SMEs have expressed difficulties in protecting the time priorities required; certainly not because they are less motivated, but simply because time- and training priorities for obvious reasons is a very relative concept in a small enterprise.

Packaging and timing therefore are key organizational and educational parameters in satellite based education.

Many EuroPACE user organizations use the satellite as a mechanical delivery device separated from the actual use of our programmes. They base the local sessions on the delayed use of recorded programs and thereby enable processes that are structured according to and open for local user requirements: Taped modules can be split into shorter sequences, sequences can be re-played for further discussions and explanations, embedded exercises can be skipped or integrated in the session as required etc.

More and more Receiving Sites are starting to organize 'real-time' sessions, i.e. classes or groups that follow the courses while they are being transmitted.

III.2. Interaction and motivation

Both formats seem to work fairly well in that they establish a clear framework and time-slot for the EuroPACE distance learner. The formats may also explain why feedback and interaction has been scarced and scattered in EuroPACE, and why most EuroPACE learners never use PACECOM: There's no need for it.

The assumption that the distance learner is an isolated, lonely soul, does not apply to the average EuroPACE distance learner, just as it does not apply to on-the-job learners in general: The much sought-for and much talked-about learner environment is there a priori! The workplace always has been and still is the singlemost important learning environment anywhere and anytime. The EuroPACE learner is already before s/he starts a EuroPACE session placed in an interactive network of fellow learners: Colleagues, peers, managers.

This also applies quite a lot to the EuroPACE learners who prefer to, or have to, work with the programmes on an individual and self-paced basis, ie when

convenient and possible job- and/or family-wise. This type of learner can only structure his/her course-work on basis of motivation, eg interest in and/or a tangible need for information about the subject. Motivation is another key parameter in on-the-job education.

Our users have pointed at more reasons why PACECOM has not been used as much by the learners as anticipated: One reason is that the online environment has not been sufficiently integrated in and promoted by the satellite transmitted television programmes. We seem to have underestimated the need for a pro-active management and animation of PACECOM, by the lecturers and/or by other subject experts. Secondly, computer-mediated communication is time-requiring and therefore maybe not well suited for learners who are 'learners' within relatively short time-windows (max. 1-2 months, in most cases less). Even small technical barriers will keep such learners from taking the trouble of connecting to and getting acquainted with the lay-out of the online environment. That is unless it can offer substantial value added to, or is an indispensable component directly linked with the satellite programmes.

It has been argued that asynchronous and text-based computer-mediated interactivity fits better into a multi-lingual environment than audio-based interactivity. PACECOM seems to confirm this: There is a very good geographical and national distribution within the - by the way, expanding - core group of very active PACECOM users. Further, the use of PACECOM for teacher-'learner' communication during our monthly live programmes has increased during the last year. Most users seem to prefer to address the teachers through PACECOM, rather than putting the questions by telephone, directly to the teachers in the studio. The choice is free.

It would be a complete misunderstanding to conclude that interaction does not take place in EuroPACE. It most certainly does. But on the learner side, this interaction is to a large degree kept within the local environment ('locally' either at one particular Receiving Site, or 'locally' within a geographically dispersed network of Receiving Sites belonging to the same corporation).

From one point of view, EuroPACE is facing the reverse version of the classical isolation syndrome in distance education: Many of the lecturers often feel that they are left out, communicating to the black eye of the television camera, and that all their efforts are disappearing into the black nothingness of the dancing satellites. They sincerely feel that they are sliced out of the most fascinating part of the educational process.

EuroPACE still needs to enhance and expand the loops integrating its 'teaching' and its 'learning' populations. Particularly in the case of EuroPACE, the enhancement of these loops holds enormous synergetic potentials: The distinction between the teacher role and the learner role is often quite superficial. The EuroPACE 'learner' is her-/himself an expert in the subject, probably just representing a different approach and experiences complementary to the subject expertise of the teacher.

Synchronization may be one useful strategy.

III.3. Synchronization: how?

It is good preaching in distance education that distance should be understood as a social category and not as geographical. We have all the gadgets to overcome geographical distances, and telecommunications provide us with the means necessary to overcome the social distances.

The degree of synchronization between the teaching and learning processes is one important parameter for the creation of social and pedagogical momentum in the distance education environment.

This constitutes one of the basic differences between the American and the European approach to the use

of satellites in distance education: The American approach stresses synchronization, whereas most European satellite programmes have applied an asynchronous approach. I have already listed the arguments for the latter above: They all point on the need for flexibility and for the possibility of applying local tutorial systems, a need that is obvious in a multi-cultural and multi-lingual European environment.

So while I am not quite sure whether the American model can be applied to European distance education, it has some very interesting implications.

90% or more of all satellite based distance education is done live. Programmes are uplinked directly from corporate training centres or from university campuses. The teacher is often lecturing to a local class and to the remote classes/groups simultaneously. The latter can interact with the teacher by telephone, or, as is often the case, through leased lines using simple keypads that facilitate immediate audio-feedback and other types of feedback (polls, multiple choice tests etc.). A class can last 2 hours or, as is often the case in some corporate education, be stretched over one or two days with a number of off-line assignments/exercises integrated. This approach has been characterized as the Candid Classroom approach, using fixed and/or remotely controlled cameras. To save money and give room for as many parallel sessions on the same satellite transponder as possible, transmissions are either done on half transponders (C-band!) or as 2Mb video-signals, with the audio-feed on a separate channel.

Within the American synchronized approach, focus seems to be on the processes taking place within the programme.

The degree of involvement in the process therefore becomes important. Many lecturers have had difficulties in finding a balanced interaction with their two audiences: the local in front of them, and the remote groups at the end of the satellite network. If they paid special attention to the remote groups in order to encourage them to participate, the local class felt left out and would react negatively. And vice versa.

The European asynchronous approach leads to focus on the design qualities of the programme. It creates an expectation of the pedagogically and technically optimized exploitation of the functionalities and characteristics of the television medium. And it puts demands upon the lecturers to apply lecturing techniques that can compensate for their absence in the user situation.

Quality design requirements are and always have been very high in European distance education. Can we keep these requirements in focus and still develop new types of dynamic educational processes? I think this is a relevant question. I also think that satellites still hold many potentials to be explored and exploited.

IV. The Mysteries

Satellites may be an intermediary technology in a long-term perspective, something to be used as best possible while waiting for the terrestrial networks of the future.

But as already said, they do what all telecommunications services do: They enable communication between human beings. They shorten social distances, they facilitate dialogues. That's why telecommunication is the key technology in distance education.

Having said that, I have to say that telecommunication represents a genuine mystery to me. I don't understand that it works. I don't understand that telephones work. I don't understand that television works. I don't understand that computer networks work. I don't understand that satellites 32.000 kilometers away can reduce the distance between me and Manuel in Lisbon to one split-second. But tomorrow there'll be another EuroPACE programme on one of the

dancing satellites. And this paper will be sent by X.25 to Madrid where a kind person on the 6th floor in Fundesco will be busy formatting it on a PC, because I've been late as usual. I submit to the mysteries. They work.

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Options for EUROSTEP

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OLYMPUS is an **experimental** satellite; ESA, the European Space Agency, has given 9 hours a day transmission time on the European DBS-transponder to the education and training community in Europe for experimenting (i.e. verifying technical, economical, educational viability) with new services, products and markets.

In 1989, the bodies and institutions ESA allocated time to found "EUROSTEP" as a **users association** to take care of the legal responsibilities (a.o. operational agreements with ESA and the members) and operational functions (scheduling, transmission, user liaison, marketing, evaluation) involved.

EUROSTEP is transmitting regularly 7 hours of programming a day since January 1990 (including teletext and data broadcasting) and has achieved a high degree of credibility with its membership and with the learning community in Europe at large.

A SWOT-analysis of EUROSTEP.
(Strengths, Weaknesses, Opportunities, Threats; but in reverse, "pour me permettre de finir en beauté")

1. **The Threats:**

The life-span of the OLYMPUS satellite and of its European DBS-transponder (early damage to which may not be a big chance but represents an enormous risk); if EUROSTEP aspires for survival after OLYMPUS, it should urgently develop activities on other space segments, (which it has in fact begun by retransmitting, since November 1990 part of its programmes on the OLYMPUS-RAI transponder and having well advanced in negotiations with at least two other satellites operators).

Is the **D2MAC** norm, now used for the EUROSTEP transmissions, going to achieve a real acceptance as **the** European broadcasting standard? If not, or not within a reasonable period of time, EUROSTEP may be forced back into PAL, thus losing the D2MAC assets (enhanced picture quality; multiple sound tracks, allowing for multi-lingual broadcasting; data transmission; provision for sophisticated encryption and conditional access). (Continuing commitment of the European broadcasting industry to D2MAC appears compromised today).

Will EUROSTEP succeed in securing a sound **financial** basis for its survival? The total annual budget now approaches 1 million ECU and only allows for a bottom line operation (e.g. not including national user liaison or evaluation, let alone investments in development activities, thus compromising the longer term viability if the financial is not improved rapidly). ESA is paying nearly 85% of the budget but there is no perspective for this "seed funding" to continue on an adequate level beyond the first few years of operation.

Users are now paying only 40 ECU per hour as "transmission levy", while the real cost, <u>not</u> including the space segment, is near 1.000 ECU per hour. Can (all?) members afford to contribute a more substantial part of the cost? Would it be feasible to differentiate between "premium" and "common" users, where the real cost would be the criterium for pricing while "poorer" members could have (part of) their contribution subsidised?

Or will EUROSTEP find new sources for (commercial or public?; national or European?)

funding? If so, it should happen very soon! Participation in one or more of the existing EC-programmes may pay for additional services with eventually some overhead on top, but should not be expected to substantially secure the core operations of EUROSTEP.

2. **The Opportunities:**

The **space segment**, offered for **free** by ESA, forms the basis for a unique - and probably last if not succeeding properly - testbed for experimentation.

The **experimental** nature of EUROSTEP is in itself an opportunity for its members, who often just marginally succeed in funding their projects and can now, without extra risks or investments, experiment the additional possibilities of satellite transmission.

The **value added** by satellite delivery (e.g. live transmissions allowing for **interactivity** through audio and/or data return) over a mere, even if more reliable, faster and cost effective, transportation service.

The unique **footprint** which, especially if combined with the Italian transponder, allows for a truly pan-European coverage.

3. **The Weaknesses:**

EUROSTEP is a **users** (i.e. programme providers, not the "end users") **organisation**, which tends to make it **supply** (rather than demand) **driven**.

It is an **international** organisation which is a challenge in itself, i.e. not the easiest thing to manage in a streamlined fashion and at any rate **expensive** (with a secretariat in Leiden, the Netherlands; a scheduling centre in Dublin; a transmission operation in London and, probably later this year, in Belgium; members all over Europe ...).

EUROSTEP is a **common carrier** for formal, informal and non-formal education which would make it difficult, if one would wish so, to forge it into a genuine **"educational channel"**; it is not really, even if an experiment in itself (next to the members' experiments), "educational" (the members' projects are!).

Are **commercially viable** market-product combinations for distance and flexible learning through satellites in Europe to be foreseen in the medium term? The answer to this question should be the outcome of the EUROSTEP experiment, but if the answer proves to be "no" prematurely, this might compromise the experimentation itself. And anyway, "successful" (i.e. self-supporting, with eventually some margin to contribute to EUROSTEP itself) members will have to leave OLYMPUS, because they will be considered to be no longer "experimental", giving way to fresh, new, bright experimental ideas.

There is no convincing perspective for a real **audience** for DBS in D2MAC in Europe in the foreseeable future: no-one dares to make an optimistic prediction on the evolution of the market penetration of D2MAC receivers (D2MAC is a nuisance rather than an asset in this regard); the legal (copyright clearance, re-transmission rights) implications of cable re-transmission are much more complicated than expected so some successful "legal engineering" is needed before the increasing number of cable connected households and institutions may be enjoying EUROSTEP's programmes.

4. **The Strengths**

Most members have succeeded in meeting the required number of programming hours supplying programmes of **high** standards of (technical, productional and educational) **quality**.

If we consider EUROSTEP's members as educational **projects** (not just video producers), which in most cases do take into account their target audiences, then EUROSTEP may evolve into a **demand driven** users organisation.

The **cohabitation** of "commercial" and "humanitarian" projects on one common carrier allows these to mutually support each other and can be an advantage for both.

Most "threats" and "weaknesses" described are potentially harmful only if EUROSTEP has the ambition to become "the educational satellite broadcasting channel for Europe" (which part of its membership may aspire at).

But if EUROSTEP's mission is to be a consortium of narrow-casting experiments, serving their common interests, then the "opportunities" and "strengths" prevail; on the condition adequate funding for this type of experimentation can be secured.

EUROSTEP will then be in a position to offer services, essential to the next phase of DELTA, be it by initiating one or more projects, or serving as a partner c.q. subcontractor to a project consortium. In any case, the tariffs applied for the services provided will have to be carefully considered taking into account the longer term viability of this type of testbed for the benefit of further R&D on, and implementation of, satellite delivered distance and flexible education and training in Europe.

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Satellite Medical Education and Data Transfer: Opportunities and Pitfalls

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Abstract

The SATDOC project, which is part of the exploratory phase of the EEC-funded project DELTA is, in essence, a number of experiments in satellite terrestrial and cable transmission to five test centres in Europe, to test innovative technologies in distance and flexible learning enviroments, whilst looking at the educational content and the language and cultural dimensions of the different user groups in Europe.

Introduction

There are two very good reasons to educate doctors: the economic argument recognises that health care systems throughout the world are facing the most alarming cost explosion with escalating expenditure borne either by the private individual, insurance companies or state-funded systems. The upward pressure has been occasioned by the growing demand and expectation from the patient, coupled with the greater availability of expensive technical procedures and therapeutic agents. These factors, together with the demographic changes occurring in the population, mean that far more can be done for far more people for far longer.

The other argument is a purely practical one, and that is that people usually still object to dying unnecessarily through medical blunders!

Thus it can be argued that education of doctors is a good thing in all senses of the word.

When the concept of distance learning by information technology was considered for the medical profession it was felt useful to derive a philosophical framework or some guidelines to help with the focussing of the intellectual effort. The following guiding principles were determined:

1) "Beware the technological imperative"; by this is meant that just because something can be computerised, it should not necessarily be computerised. Whatever is done, using the information technology, should be done better not differently. Technology is a good servant but a very poor master.

2) Whenever possible existing information technology should be used or adapted and evolutionary approach with the introduction of new technology should be adopted, rather than a revolutionary approach (whereby the learner has to purchase new technology and new equipment).

3) It was recognised that the learners would be busy professionals and the one commodity of which they would have least would be time. Thus the distance learning packages should be suited to the learner's needs and it was recognised that much of the learning would take place towards the evening time in the doctor's own home.

4) It was hoped to produce a technical solution to the problem of the distribution of learning material by combining the advantages of both television and video cassettes. Television has the great advantage of ease of distribution and can be very cheap if material is transmitted during "downtime" (i.e. usually at night, when transmitters would otherwise lie idle).

On the other hand, the control characteristics of a video-cassette enable the learner to view selected material at a time convenient to himself; furthermore, the "stop" and "replay" facilities enable educationally difficult material to be reviewed and thus assimilated more easily. The major problem with video-cassettes as a learning tool is the logistics of a distribution mechanism which is labour intensive and thus costly.

5) As a further guiding principle, whatever technology was developed should fit in within the educational marketplace. By and large, elegant but expensive solutions were to be avoided.

Learner Characteristics

a) The learner was usually a postgraduate; thus his educational requirements would largely be an updating of knowledge and skills. It would be unlikely that totally new concepts would be introduced.

SATDOC OBJECTIVES

A) To develop a Broadbased Educational Medical Information Centre (BEMIC) in phases. First Phase (PIPA-crypt) complete. Further versions are being developed to meet diverse needs which have been identified through market research.

B) To produce and transmit a number of specially made video programmes, using satellite transmission.

C) To make French, German and Spanish versions of these programmes, in order to:

D) Examine the effects of English language on the learning process for our European partners.

E) To examine the cross-cultural dimensions of electronic educational transfer.

b) The learners were mature postgraduates and thus they were used to working by themselves and would require a minimal amount of supervisory tuition. They may well be self-motivated, the concept of the doctor as the perpetual student is a very attractive mediaeval one, or they may be required by their health care system to undertake a statutory amount of post-graduate medical education each year to maintain their Board's accreditation.

c)They are largely isolated, they are working alone and they may be isolated both intellectually as well as physically. These learner characteristics reflect, I think, on the sort of distance learning package that they would find acceptable.

Educational or Learning Styles

It was also thought of value to examine the different educational models and to adapt the technology to suit the most appropiate model. There are a number of models to consider:

i) Didactic. This is the traditional method whereby the teacher stands up and talks and the pupils by and large are passive and listen. This has its place and is particulary relevant when the teacher knows and the students do not. It is, in essence, a "pin your ears back and listen" situation.

ii) Socratic. This is a much more mature way of learning in which colleagues will explore a project

together and try to examine common solutions and then evalute them, in essence "let's you and I explore this problem".

iii) Audit exercises in peer groups. This has been shown to be a very fruitful way to instruct mature learners who are influenced by peer pressure. In essence, they are asked to examine their work, they are then asked to compare the similarities and differences - those differences are then evaluated to see whether they are significant or not; and if possible a commonly agreed protocol for treatment or procedure is then agreed. This has been shown to be a particulary powerful method of changing behaviour and is well-suited to the distance learning facilities developed by the SATDOC project.

SATDOC Project

This project was designed to be a number of experiments using satellite, terrestrial and cable distribution systems to provide general practitioners with an educational distance learning module.

Five European centres were involved and groups of doctors based on the academic departments in each centre assembled to create a "user group". The countries were chosen as far as possible, to represent different learning needs and different health care systems within the EEC. Dublin, Madrid, Nottingham, Leuven and Amsterdam were the sites chosen as they already had existing advanced networks of interested doctors rooted firmly in an academic matrix.

One of the major innovations to come out of the project was the development of a delivery system which automatically controlled the major functions of any remotely controlled video cassette recorder. This device is a small black box initially called PIPA-crypt (standing for Pre-set Infra-red Programme Accessor). The intended commercial name is to be VideoLink. It has a number of important functions:

1) It is able to switch on an ordinary video cassette recorder in response to a broadcast signal. Thus it is possible to use downtime with regard to both satellite and terrestrial broadcasting. It has been estimated that virtually every broadcasting system has a considerable amount of downtime usually in the middle of the night, when the equipment is not being used for regular broadcasting but when it is suitable to broadcast our educational module. This simple facility opens the door to inexpensive broadcast transmission.

2) It was necessary to develop a secure encryption system. This was partly to comply with the various medical regulations which largely forbid the broadcasting of programmes specially designed for doctors to be seen by the general public. The other reason is that this service was seen to be on a subscription basis for the learners: thus unauthorised viewing should be discouraged.

The educational distributor of the programme has two video encryption options, and chooses whichever option is most appropiate for his particular distribution network. The programme may either be recorded in an encrypted form and only replayed via a VCR with a " VideoLink " or it can be recorded "en clair" after decryption. These options allow the distributor to protect the copyright and authorship in the best way possible.

3) Audio Encryption System

During transmission the audio analogue signal is converted to a digitalised signal which is then inserted into the luminescence component of the video signal occupying a slice of the left hand side of the picture. The normally used audio track is therefore unused and available for substitution with an alternative sound component, which would be in plain transmission if heard directly off the air. This facility could be very valuable in language teaching as the learner could watch a pre-recorded video learning package in the language under study or in his own mother tongue, at the press of a switch.

4) One version of the VideoLink has a printer port - thus a data stream can be provided and additional information printed out when relevant. It was felt that this would be particulary helpful in the assessment of the educational material and questionnaires could be printed out and completed by the participants.

5) Conditional Access

Each downloader has a unique number; thus transmission can go to groups or subgroups or even individuals in possession of a downloader. By the same token, an individual downloader may be disabled by a broadcast signal. This is an essential prerequisite of a subscription service. If it is to work effectively, there must be a simple mechanism for disconnecting and/or re-connecting defaulters who fail to pay their subscriptions.

6) The VideoLink has a beacon facility which is a small red light on the front of the machine, which is lit in response to a signal. If there is information of importance for the doctor, he is alerted by the light which is triggered by a broadcast signal. This is recognised as a very useful device for warning the medical profession of the possibility of disaster scenarios without necessarily alarming the general public.

7) The final aspect of this development was that the whole machine should be economically priced so that it could fit within an annual subscription system. The price at the moment is below ECU 150, and thus it could be included neatly in the economic matrix which can be afforded by the learner.

Feedback Links

As well as developing a delivery system to the learner, it was considered important that there should be a feedback mechanism from the learner to the tutor. As previously mentioned, much of this feedback would be related to audit exercises or post-course assessment. A number of electronic systems have been developed using small hand-held micro computers (the Psion) with an EPROM link or a lap-top computer with a modem link. These have been tested through seven European countries on a practical basis and found to be robust and very satisfactory for their required purpose. In the future, we will be looking at sophisticated mailbox linkback systems.

Language

Another facet of the project was to examine the impact of the English language process. Programmes were made English ,and English with English sub-titles (particularly valuable for some of our European colleagues who read English better than they speak it). The other languages used were French, Spanish and German. A number of tests of acceptibility in different languages were carried out by our European centres.

Cultural Barriers

As part of the research project the different medical cultures and their educational expectations were explored. The rationale for doing this was that it is now extremely easy via technology to transmit one learning module from one cultural system to another and, unless due thought has been given to the acceptability of the content of this module, then it may seriously impede the learning process because the cultural content is so jarring to the learner that he is totally distracted from the **educational** content. This is a fascinating field and is one which we are exploring further.

Pitfalls

a) *Standards*

"The nice thing about European Standards is that there are many of them and they are frequently changed".

We have seen the past few months the rather unexpected demise of one of the major satellite broadcasters using the European standard of D.MAC as its transmission standard. Thus the standard, together with all the organisations making inexpensive D.MAC receivers have been placed in jeopardy. The future position of D.MAC as a European standard is at the time of speaking (January 1991) uncertain.

CURRENT TRANSMISSION TESTING POSITION OF VIDEOLINK TECHNOLOGY

Completed tests:

Broadcaster	Type	Test:Date	Comment
BBC	Terr	01/03/07/90	Successful
Olympus	Sat	05 1990	part-Successful
TVNZ	Terr	05 1990	Successful
United Artists	Cable	07 1990	Successful
Westminster	Cable	07 1990	Successful

b) *Collaboration of SME's*

It has been shown that usually SME's are the source of most of the exciting leading edge technology in the field of educational technology. However, this gives rise to a paradox, in as much as these organisations have only a limited number of talented workers to devote to the field, and their time is the most precious commodity the SME's has. Thus the organisation may be very reluctant to allow its talent to pursue goals which do not have an immediate financial return.

c) *The Human Log-jam*

It is true in the field of information technology, as in others, that what exists has enormous power and influence on what can be created in the future. Some things are changeable, but much is not, and an early recognition of what can be altered and adapted is usually of very considerable benefit. This is not new and was nicely described by Machiavelli:

"and it ought to be remembered that there is nothing more difficult to take in hand, more perilous to conduct or more uncertain in its success than to take the lead in the introduction of a new order of things.

Because the innovator has for enemies all those who have done well under the old conditions and luke warm defenders in those who may do well under the new".

Future Activities and Developments

The development of a number of VideoLink user groups with terrestrial cable or satellite television could be used as a practical experiment to test many of the advancing technologies in flexible learning in Europe:

1. Background

1.1 The need to educate or retrain large numbers of the adult population in Europe is well recognised. The changing politics of Eastern Europe will add, it is to be hoped, to the group of young adults who will require further higher education, especially in areas such as language, health care and business management.

1.2 Traditional centres of higher education, like universities or polytechnics, cannot possibly cope with the extra demand; thus the need to develop flexible distance learning programmes becomes increasingly more urgent. This factor should be the main "raison d'etre" for a DELTA programme to continue into the 1990s.

1.3 The application of Information Technology to education will need to develop educational networks which can grow into a service which is affordable by the vast majority of potential learners; but at the same time as developing implementation strategies, validation experiments will be required by the developing leading edge technologies. Care will be required to achieve a harmonious balance between the different aspects of a continuing DELTA programme.

1.4 Thus it would seem sensible to build not only on existing DELTA deliverables,but also to link them where appropiate to produce services ready for the educational market place. Moreover, the existing DELTA programme, either by design or good fortune, has provided a fruitful arena in which innovations from disparate disciplines and countries can pool their expertise creatively to build larger application projects.

1.5 The technology must be a real advance for the learner and not just an elegant solution looking for problems. Studies from the SATDOC project confirm that the learner is concerned primarily about the educational content of his work programme, its accessibility and cost, and how easy it is for him to get advice or feedback from his tutor.

1.6 The consortium of the SATDOC project, together with several partners from the DELTA Action Line III consortia intend to develop a number of application projects in networking technology. This network, though initially set up for medical and allied health workers, would act as an example of this kind of distance learning technology for other interested disciplines. Language teaching, business studies, accountancy and management programmes can all be adapted for this type of flexible learning. It would act as a test bed not only to implement some of DELTA deliverables into services prior to their market explotation, but also to act as a framework for validation experiments with newer technical advances.

2. Delivery System for Electronic Distance Learners

2.1. Satellite Broadcast

Experiments are needed to test the commercial and technical feasibility of using existing satellites like Eutel 2 and Astra together with experimental satellites like Olympus as a vehicle for distance learning. Currently anomalies exist when education distance learning services are developed: for example, the learner would require a VideoLink receiver costing less than £100 but to receive the Olympus transmission in D2MAC he would have to purchase a dish receiver costing £1500 (April 1990), thus rendering the whole package expensive.

Economies of scale should rectify this difficulty in time, but clearly flexible learning programmes, if implemented in the market place must reflect the fact that there is no such thing as "free" satellite or terrestrial broadcasting.

It is suggested that application projects would therefore act as a test bed for the assessment of the different broadcasting standards. For education technology to be cost-effective, it must be grafted onto the standards used in the field of broadcast television. PAL is being widely adopted by satellite users, whereas D2MAC (Olympus standard) may have technical advantages but as yet can only be received in relatively few sites with costly receiving dishes and equipment.

The problem of standards is further compounded when the development of High Definition Television (HDTV) is considered. There are undoubtedly many applications of HDTV in the field of medicine, the demonstration of surgical procedure and the transmission of medical images are clear examples. Both RACE and ESPRIT have encouraged research and development of HDTV technologies. Project R1086 (HDTV Experimental Usage), part of the RACE programme, is developing a full chain of HDTV equipment from student through satellite transmission to concurrent recording playback and display. The application of this technology would fit nicely into the concept of more application projects as an experimental test bed.

The satellite delivery system would be particularly relevant to Eastern Europe with its relatively poor communications infrastructure. Thus a number of universities and education centres, particulary in Poland and Hungary, could be equipped with satellite dishes using a point to multi-point system to further

disseminate educational material. Real time satellite conferencing on the latest advances in medicine or surgery would appear to be a highly desired objective.

2.2 Terrestrial and Cable Transmission

It must be emphasised, however, that terrestrial and cable delivery systems, often with a satellite feed, will represent to the vast majority of Europeans the normal delivery system into the home or workplace. A dedicated satellite and decoder will present a more costly option than terrestrial broadcasting in the foreseeable future.

2.3 Learner/Tutor Feedback Systems

A vital ingredient of any learning package of value is the feedback link whereby the learner can seek guidance or clarification of issues of concern. The SATDOC project has developed modem or Eprom electronic links, and in future would collaborate with Action Line II consortium CONDAT in testing a very sophisticated mailbox system, the Multi Voice Mail (MVM) to be developed by our German colleagues.

2.4 The Language and Cultural Dimension

Language as a barrier to learning is still a central issue and will require continuing experimentation to delineate cost effective solutions. These may be technical (i.e) how can sophisticated technology help in providing the learner with sub-titles in the languages of his choice, or more general (i.e) the acceptibility or otherwise of English as the de facto common language of commerce and science in Europe/globally.

2.5 Cultural Dimension

Experience from the early phase of the SATDOC project suggests that the cultural dimension is extremely important in ensuring that the learner is able to concentrate on the educational content and not be distracted or offended by the different cultural context, which is inevitable if distance learning packages have a distinct nationality of origin. The educational content may be excellent but it is rejected by the learner if he is offended by inappropiate cultural context.

Thus flexible learning programmes need to research into a "European style" of educational content.

3. The Political Dimension

We all live in a rapidly changing European landscape, perhaps more so now than in the past 40 years. Huge political changes offer huge opportunities as well as risks. The Chinese have a saying "Why do you hate me so, I've never tried to help you". Perhaps the gift of education will be the most appreciated help that we can provide for our new European colleagues. Thus the case for cost effective/flexible distance learning application projects is stronger than ever.

In summary, therefore, it is suggested that more widespread cross-disciplinary application projects would be a natural extension of existing DELTA project; it would futher apply existing DELTA deliverables, it would draw together different DELTA consortia to provide distance learning services, and act as a test bed for further leading edge technologies in the field. Although developed for medicine, it would provide a blueprint for needs of other professions.

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Pan European Interactive Satellite Communication for Distance Learning

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1. JANUS Infrastructure

1.1 JANUS Concept

The JANUS (Joint Academic Network Using Satellite) project is based on the concept of using interactive satellite communication links to enhance Pan European Flexible Learning. The proposed satellite links provide a mesh topology network with voice and data communications supported directly between any two points within the network.

Each site in the Janus network will be equipped with an inexpensive satellite microterminal with a 1.2m to 1.8m dish accessing a medium/high power satellite on a demand assigned basis.

Fig. 1 shows a schematic diagram of the JANUS network. The network infrastructure is mainstream in its applicability: when fully developed, it provides the following facilities via a simultaneous interchange of voice and data traffic between microterminal sites.

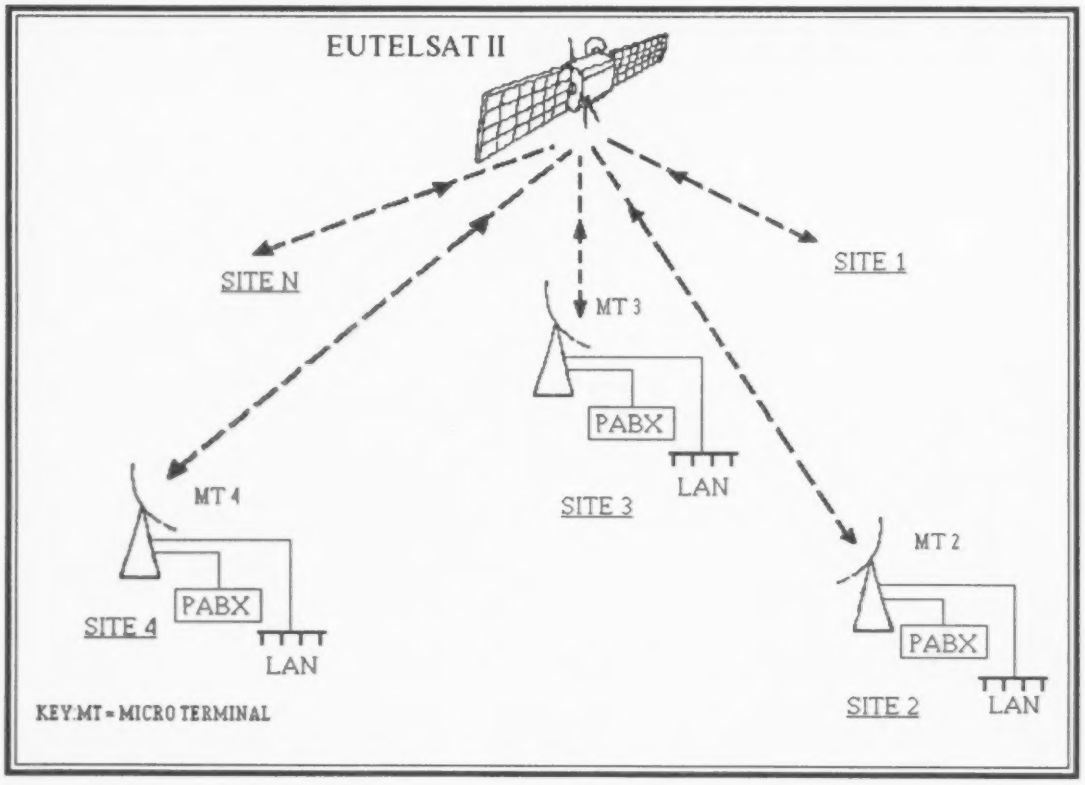

Figure 1

Voice Channel:

* one to one telephone calls

* audio conferencing

* fascimile traffic.

Data Channel:

* electronic mail and computer conferencing

* point to point and point to multipoint data transmission

* document transfer

* access to remote data bases.

The above facilities handle user traffic as well as system management information. Furthermore, they enable users to embark readily on cooperative working sessions from different sites located anywhere in Europe.

1.2 JANUS Uses

An application area which played a dominant role in developing the JANUS concept is joint authoring of courses by EADTU (European Association of Distance Teaching Universities) members. Examples of such courses are: Business Administration, Law, Humanities and Language Teaching.

Other cooperative activities which could be carried out by the EADTU members via the JANUS network are:

* collaborative research programmes

* administrative functions such as credit transfer negotiations and joint databases of courses.

The JANUS network offers a great potential in teaching applications especially via the JANUS computer conferencing (CMC)and audio conferencing facilities. The CMC facility enables the students to communicate with the nearest JANUS microterminal via the local (or national) terrestrial data network (Fig.2). The packet routing to

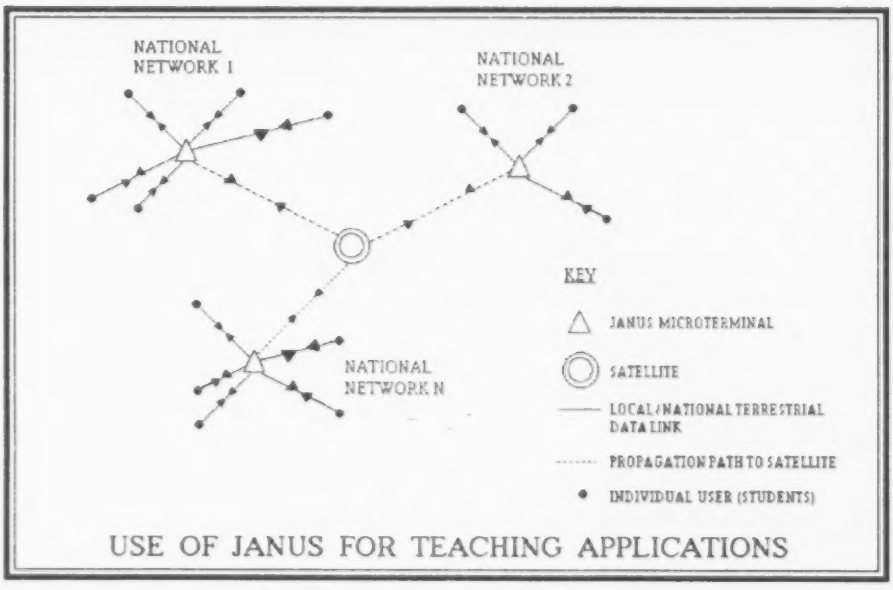

Figure 2

Pan European destinations is done by the JANUS network.

On a longer term basis the use of the JANUS network may be extended well beyond the above application areas because of the user and location independence of the JANUS infrastructure. There is a huge potential, for example, in extension of the JANUS network to:

a) other sites outside the EADTU under the umbrella of the "European Electronic Open University Network". Both modalities of usage, i.e. course material production and teaching can be provided to:

- university and corporate members of SATURN
- "traditional Universities" active in distance training.

b) areas outside the CEC, e.g. Eastern Europe or EFTA countries.

1.3 Advantages of a Satellite Based Network

Satellite networks of a different kind, i.e. hub-based, star topology VSAT (Very Small Aperture Terminal) networks have come into widespread use in the USA in recent years for corporate data communications. Published reports indicate that VSAT networks not only provide economic advantages (20% to 40%) compared to terrestrial networks but also enjoy significant operational advantages.

Although the JANUS network differs from traditional VSAT networks in its topology and its provision of a more varied portfolio of services, the economics of the network is expected to follow the same pattern. This is specially true for Pan European networks which are similar in extent to US networks.

However a Pan European satellite network offers other significant advantages such as total control over network resources, operational flexibilities, etc. The following list indicates the main advantages of a satellite based network such as JANUS:

* distance independent cost
* quick deployment
* total European coverage
* natural point to multipoint medium
* flexibility of redeployment
* total control over the network
* cost independence from European PTTs.

1.4 Choice of Satellite

Because of "telecommunication services" orientation of the JANUS interactive network a large number of European satellites could be used in principle to interconnect user earth stations. However, the medium to high power satellites are considered the best candidates since they enable small low cost microterminals to be used within the JANUS network. Another important factor which determines the satellite choice is the extent of the coverage area of the satellite "footprint".

From a techical viewpoint three satellites were selected as potential candidates for the JANUS network. Fig.3 shows a comparison of the main factors used to asses the suitability of each candidate satellite.

	OLYMPUS	ASTRA	EUTELSAT
COVERAGE	X	XX	XXX
POWER	XXX	XXX	XXX
AVAILABILITY	X	X	XXX
COST	XXX	X	XX
ACCESS	X	XX	XXX

X POOR
XX ACCEPTABLE
XXX GOOD

Figure 3

It must be noted that the Specialised Services payload of the OLYMPUS satellite is considered in Fig.3 rather than the DBS (direct broadcasting) payload employed in a mumber of DELTA projects and in the EUROSTEP network.

The Eustelsat transponder in Fig.3 relates to Eutelsat Generation II satellites. The Satellite Multi-service Systems (SMS) transponders on board these satellites are the most suitable candidates. SMS transponders are already apportioned and small capacities leased to different users by Eutelsat.

The use of the Astra satellite is considered difficult at this stage due to regulatory issues.

Fig. 4 shows a tentative scenario in which the Eutelsat II Superbeam is utilised by the JANUS network in the pilot experimentation stage. Initially the pilot test would be carried out between a hard core of more committed EADTU members (shown by circles). Other EADTU members (identified by triangles) would be expected to join in the experiments at a later stage. The final pilot phase is intented to include users from outside the EADTU (shown by squares).

Another possible scenario is based on utilisation of the Eutelsat II Eurobeam which has a wider coverage including Canary and Azores Islands, the whole of Eastern Europe and Turkey plus parts of Middle East and North Africa. An extension of the JANUS network to such fringe areas however may necessitate, in some parts, the use of microterminals with antennas larger than 1.8m diameter.

1.5 Microterminal Issues

Ideally the satellite microterminal provides an interface to:

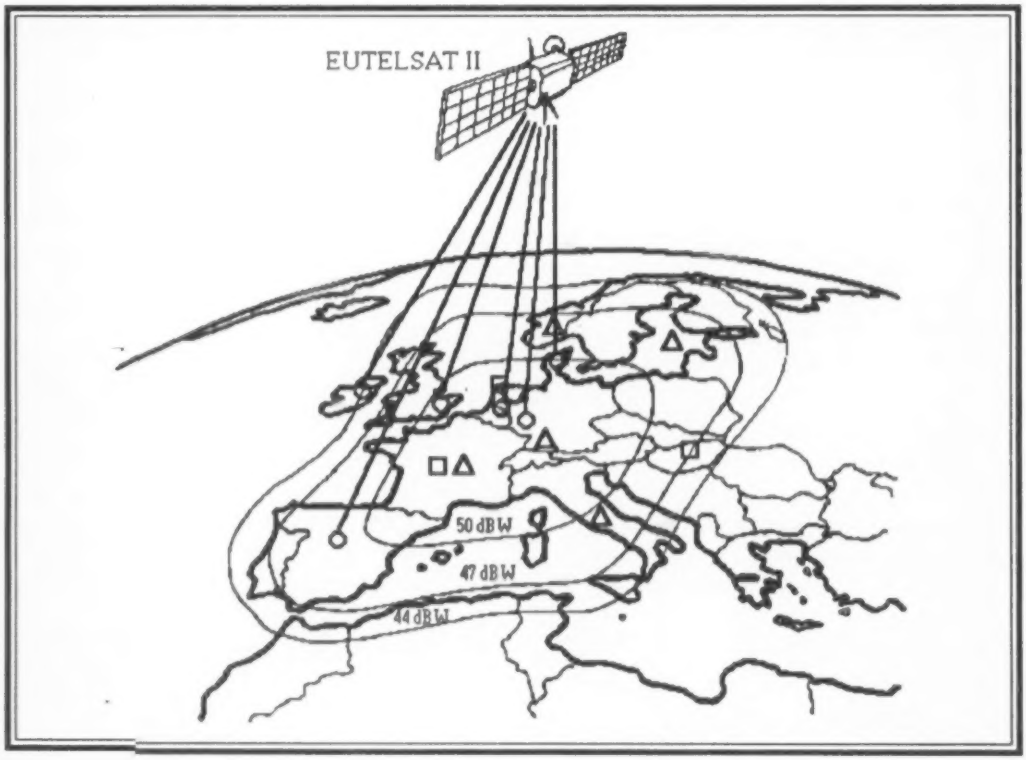

Figure 4

* Local Area Networks (LANs)

* Private Telephone Exchange (PABX)

in various sites. In this way the JANUS network can be viewed as a Wide Area Network and a special PABX at the same time.

In addition, the microterminal performs such functions as:

* satellite access simultaneously for voice and data

* demand assignment of satellite capacity to different users

* monitoring and control of network functions.

* possible implementation of security and billing functions.

The following are the key issues in a successful implementation of the JANUS microterminals and the smooth running of the overall network:

* common standards adopted by all sites/users

* more liberalisation of regulatory issues on a Pan European scale.

A number of CCITT, ISO and industry standards have been selected in the technical and educational domains for the JANUS network, to enable compatibility across JANUS sites. Further details are given in Section 2.

There have been encouraging moves recently by the CEC and the member states to deregulate interactive satellite networks and services. The CEC Green Paper issued in November 1990 and the consultative paper by the UK DTI issued about the same time concerning the Duopoly Review are examples of moves in the right direction. It is therefore tempting to visualize a scenario in the near future when such moves will result in a significant reduction of the operational complexities and cost of running a Pan European JANUS network.

2. Standards Proposed

2.1 General Standards

These include a number of ISO, CCITT and industry standards:

* ISO 8802.3 (Ethernet) for Local Area Networks at sites

* CCITT X.25 for Wide Area Network protocol between sites

* CCITT X.400 for interconnection of electronic mail systems

* PostScript for graphic interchange, with migration to CGM in time

* Microsoft RTF for documental interchange, with migration to ISO 8879 SGML as and when mass-market word proccesing products can handle this

* the AFII numbering scheme (approved by ISO) for character glyphs.

2.2 Document Representation

Because of the large number of characters used across Europe, it is important to have standards for character sets. The JANUS project has adopted the 2-byte numbering scheme proposed by AFII, the designated international registrar of language characters under ISO (with particular reference to DIS/9541-1 and DIS/10036). In earlier years, there had been many attempts to force the needed characters into a 1-byte scheme (with 256 characters); however, they were not successful, even without considering the needs of mathematical typing and Greece (let alone the emerging needs

of Eastern Europe and Cyrillic).

There will be a need for conversion between this representation and the word proccesing software used at the member sites of the JANUS network. This problem is similar to, but simpler than, the problem of SGML conversion.

3. Sample Uses of JANUS

Earlier descriptions of JANUS have been quite technical; other papers refer in vague terms to "European Electronic Networks". In this section we shall bridge this gap, by applying the features of JANUS to specific user needs in the education and training domain.

Note that JANUS has never been seen as necessarily exclusive to the EADTU. The current position of the JANUS project was recently summarised in the EADTU submission to CEC "electronic Networks for European Distance Teaching and Training". In that, it was stated as general policy:

We also recognise that although such an infrastructure is of central interest to our association (EADTU), its scope is much wider than the "core business" interest of the EADTU and its members - for example, in relation to vocational and professional training. Fortunately, in general our links with industry are good - on a bilateral basis for a number of our members; through an agreement with EuroPACE.

Although JANUS is initially oriented to the needs of EADTU members, such a network should have considerable value to a larger community of users, such as the larger industrial members of SATURN, and some other universities and training providers.

Size of the JANUS Network

Some preliminary calculations suggest that with a traffic pattern for data similar to that expected between EADTU members, the JANUS network could support up to 100 microterminals. This would allow the federated organisations in EADTU to have a JANUS microterminal at the site of each member, and multi-site organisations (such as the UKOU with its 15 existing sites) to have a microterminal at each site. In the unlikely case that all current members of EADTU took up the option of a microterminal at every one of their sites, this would still only amount to about 50 sites. Thus there is great interest in adding non-EADTU members to the network.

If the number of JANUS sites were to get very large, there is no technical problem in setting up additional JANUS networks. The best approach might be to set up JANUS-type networks based on natural communities of interest. We are also hoping to study higher-traffic versions of JANUS terminals which could be of great interest to the largest educational and commercial sites.

Cost

The capital cost of the JANUS sites microterminal is designed to be affordable by larger universities and training organisations. Running cost of the network will be lower than PTT-supplied satellite networks because the JANUS networking organisation intends to make direct application to a satellite service supplier under the terms of the CEC Green Paper on satellite communications.

3.1 Cooperative Authoring

This was the original justification for JANUS.

The authors at the various member sites of JANUS, will be connected together in a wide area network with the same general functionality as a minority of them are already used to on the European academic and research networks (such as JANET in the UK). This will give them electronic mail, file transfer, and access to centralised services such as computer

conferencing and bibliographic databases. This network will be free at the point of use. However, there are several important differences between JANUS and the various terrestrial academic networks that are being developed:

* Users will be able to have telephone contact as well
* The network will be able to connect to commercial sites

* Dial-in access will be allowed (for data calls but not for voice), e.g. for academics working from home, and for students

* The interface to the network will be integrated with the workstation on the author's desktop

* Point to multipoint services (such as multiply-addressed electronic mail) will be economical to implement

3.2 Database Access

Users at one JANUS site will be able to access databases at another site via the JANUS network. For example, the UKOU is the European host of the ICDE world database on distance education. Scholars at other JANUS sites will be able to access this. It is also likely that sites will set up databases of course material, assessment questions, clip art, and other fragmentary but useful educational material for use by (and maybe even sale to) users at other sites.

The current phase of the JANUS project has not looked at the problem of providing user-friendly access to such bibliographic databases (which on the whole still have 1970s-style command-line interfaces); however, we expect in general terms to be able to apply the techniques we are developing for user-friendly access to electronic mail and computer conferencing. A separate development work item may be needed if the need for database access gets a higher priority from the JANUS users.

3.3 Student Access to Computer Systems

An important service offered by JANUS is Computer-Mediated Communications (sometimes called computer conferencing). This has been used effectively in other contexts for distance teaching, and there is every reason to expect it to be useful over JANUS: indeed, more useful because constraints of cost and line quality will have been removed.

This means that whoever has a JANUS microterminal can "tap in" to the JANUS network for training purposes. But this does not just apply to JANUS sites. Although the higher functionalities of the JANUS network may only reach the JANUS sites, it is possible for students (at home or the workplace or smaller colleges) to access the JANUS network by using the (terrestrial) public data network to call their nearest JANUS node. Although such access is not free, it is much cheaper than making a data call to a host system in some other country. Thus a student in one country (say France) will be able to access any host anywhere in the JANUS network for the same cost (provided that he is authorised to use it, of course). Looking at it the other way, a service provider (for example in the UK) will be able to use the network to reach students anywhere in Europe at the same cost (more or less) as he can reach students in his own country.

3.4 Audio Conferencing

Since JANUS provides audio conferencing, users at any JANUS site can be linked together into an audio-based "distributed classroom". This feature may even be of more interest to the "conventional" university members of the JANUS network than to the distance teaching universities. For example, the audio-conferencing network (augmented by graphics if necessary) could be very useful for tutorials in recherché subjects where a critical mass

of students cannot be assembled at any one site. Such audio teleconferences may be natural partners to the use of satellite broadcast video.

However, the audio conferencing function will not be available outside the JANUS sites. This is mainly for regulatory reasons (even under the liberalised regime of the Green Paper).

3.5 Video

There is one function that the current design of JANUS microterminals do not provide: video. However, we believe that a one-way video capability could be added relatively cheaply to JANUS microterminals. This would allow a richer set of educational experiences: for example, activities like broadcasting with an audio teleconference (or computer conference) after the broadcast. However, it is not likely that the TV broadcasting requirements of major partners in the EADTU will be handled on the same satellite as the JANUS satellite; thus a separate TV-receive-only dish may be the better choice.

3.6 Data Broadcasting

The point-to-multipoint nature of JANUS lends itself to many information distribution applications for the consortium of those who have JANUS microterminals. Drafts of course material would be distributed this way as part of the cooperative authoring process, and there is no technical reason why final versions of course material should not also be distributed like this, for example for printing and distribution locally. We also expect that the computer conferencing system used will be a multi-node distributed one, with updates to conferences flowing in a point to multipoint way over the JANUS network.

We are considering the development of cut-down JANUS terminals which would be receive-only. These receive-only earth stations would be an "outer fringe" to JANUS. They might be particulary useful to deploy at study centres and SME company training locations. Such locations could "record" the JANUS traffic, but if they wanted to interact, they would have to contact the nearest JANUS site via the terrestrial network (for example the public X.25 network).

An alternative approach is to send the one-way JANUS traffic as a data feed to a subcarrier data broadcasting service on one of the TV broadcasting satellites. This approach would allow the use of more standard terminals, although special software would still be required.

The decision to link such "outer fringe" sites to JANUS or to TV broadcast will depend on commercial as well as technical factors.

3.7 Eastern Europe and Other European Areas Outside CEC

Because of the poor terrestrial infrastructure in much of Eastern Europe, VSAT satellite networks such as JANUS form a natural mechanism for delivering communications services to key education and training institutions such as the large technical universities. The current (West) European satellites have much better coverage of Eastern Europe than is commonly realised.

Eutelsat II

The Superbeam provides an EIRP of 52 dBW at the centre, falling gradually to 44 dBW at the outer regions of Europe as well as over the northern strip of Africa. The 50 dBW contour encloses the central parts of Western Europe, as well as East Germany, western Poland (Poznan, Wroclaw), and western Czechoslovakia (Prague). The 44 dBW countour, which is needed to enclose Dublin and Lisbon, encloses the Baltic republics, Poland, Czech-oslovakia, Hungary, and the northern half of Yugoslavia (with Belgrade just beyond).

The East Wide Beam Provides a 44dBW EIRP to almost all of Western Europe and most of Eastern Europe. Poland, Czechoslovakia, Hungary, Bulgaria, Yugoslavia and the Baltic republics are within the 44 dBW contour. Romania is half in, with Bucharest right on the contour. The 39 dBW EIRP contour allows a further extension of the coverage to North Africa and the Middle East. Moscow appears to be just outside that contour; but Leningrad, Kiev, Odessa and the Black Sea and Caucasus regions are within it.
Two Eutelsat II satellites are to have modified footprints to cover Moscow and Western part of USSR.

Astra

With Horizontal Polarisation Mode 2 as an example, the highest power contour, 52 dBW, covers all of East Germany, and the western quarter of Czechoslovakia including Prague. The 46 dBW contour, needed to enclose Naples and Lisbon, covers almost all of Poland, Czechoslovakia, and Hungary.

Olympus

The specialised services payload is the only one suitable for JANUS. The five-beam array of circular spots has a spot "C" which in standard position is centred on northern Yugoslavia and covers most of Czechoslovakia (with Prague on the edge), southern Poland (Krakow), Hungary, and the western edge of Romania.

In conclusions:

* JANUS microterminals could be placed (technically) in much of Eastern Europe, since it is covered by satellites of interest to JANUS.

* There are no conceptual problems with character sets used in Eastern Europe (including Cyrillic) - they are all included in the AFII database. However, we need to gather further information on local standards for character sets, and to develop further conversation utilities.

Institutional Models

The following observations need to be validated (and possibly refuted) by a study.

1. Initial provision of JANUS in Eastern Europe might be the installation of JANUS microterminals at key centres of expertise and training (major universities, government training agencies, headquarters of large state corporations).

2. Initial use of JANUS might be largely in "training" mode, linking local students (managers, researchers, trainers) to West European experts and training resources.

3. A particular theme, apart from the obvious ones of financial and management skills, might be training up local "training planners". These training planners would have to learn about distance education methods and media-technology choices (appropiate to the local situation) as well as how to mount large-scale face-to-face programmes.

4. We expect that the more advanced sites would quickly progress to the use of the JANUS cooperative authoring tools as a way of entering a dialogue with training providers in order to customise "imported" training material to the local environment.

5. A final stage would be when the sites begin to participate as full authoring members of JANUS curriculum projects. There are some countries and some subjects where one might expect this to happen within a relatively short period.

6. Other uses for JANUS would be access by research institutes via the JANUS network to Western on-line databases and academic or research networks.

4 . Conclusion

We are entering the final months of the planning phase for JANUS. Without pre-judging the Final Report, we are now confident that JANUS networks would provide a cost-effective solution to a large part of the telematic network needs of Europe-wide distance education and training.

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Overview of CAPTIVE

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Introduction

This meeting is being held under the auspices of the DELTA Programme Exploratory Action with particular emphasis upon communications facilities, and is concerned with technology based training. The paper gives an overview of the CAPTIVE project which was a multi-strand project looking at several innovative aspects of the production and transfer of images for educational and training purposes over a prototype network for European wide education.

The CAPTIVE project is a consortium of partners of different disciplines at academic level, in different educational environments from five different European countries; England, Norway, Belgium, Portugal and the Netherlands. This consortium has set out to explore a new model for the transmission of images in the field of distance education. This model integrates an advanced fibre-optic network, LIVENET that provides interactive live video for teaching for the University of London with the Olympus Satellite Direct Broadcastiong service organised by Eurostep. Using both the DBS transponders of the Olympus Satellite , broadcasts can be directed over the whole of the European Economic Community. This model offers new possibilities for all kinds of distance education to enlarge the local audience, and to make more efficient use of skilled teachers and experts. The CAPTIVE model is supported by a didactical tool, the video image base and expert system which improves the teachers ability to develop courseware using video material.

To keep this work in line with developments in other fields of video and image processing, considerable attention has been given to standards and one member of the project is an active member of standard committees.

The CAPTIVE model provides:

1. Interactive live distance education.
2. Interactive generic distance education (off the shelf courses)
3. Interactive live collaborative authoring, production and editing.
4. Interactive production of video programmes, linear and interactive, by support of a video image base and a video material knowledge base

The CAPTIVE project focuses on Communications Technology and Educational Technology.

Communications Technology

A number of different experiments have been performed to test the communications technology, and the aims in this field can be summarised in a single sentence, - to investigate the ability to move images over wide area networks for educational and training purposes taking into account present day technology and the potential developments of this technology.

This sentence begs three definitions; firstly what are images, secondly what is the nature of the network being investigated, and thirdly what technology is considered to be "present day".

Images in this context refer to pictures in the video format. These images may be handled in digital format in workstations, but for transmission must be in analogue video format. This permits both full-

screen moving and still images and introduces the concept of the hybrid systems. Rapid changes are taking place in present day technology in the field of digital video images, which can be expected to influence this work in the near future.

The network under consideration is based upon a metropolitan fibre optic network linked to satellite uplink with satellite coverage over the whole of Europe. Associated with this is the use of the PTT telecommunication networks for Electronic mail, ISDN services etc., covering the whole of Europe. Within the framework of DELTA this has to be applied to innovative ways of developing and delivering courseware.

Let us consider what is involved in the development of courseware. We believe there must be firstly the facilities to define the content of the courseware, and if this is to take place on a European scale then this content will be the result of intensive discussion between partners scattered all over Europe, e.g. the COMETT II Programme. The use of conferencing facilities, whether, computer, audio, video or some combination of these, need to be explored and developed.

Next, when the courseware content has been defined, then it needs to be assembled, and the cost of assembly has to be kept as low as possible. This leads to the concept of reusability and thus to the setting up of databases, and images bases. These require sophisticated tools. There must be :

1. remote access
2. intelligent assistance and guidance through the database
3. a browse facility
4. samples of the visual material itself

The description and handling of visual material introduces problemsand requires innovative solutions, as this material may be still or moving images. The re-use of visual material in courseware is dependent upon a set of factors, the most dominant being compatibility and resolution. The way images are interpreted by the viewer depends on subtle factors, partly visual tricks and partly context. When moving images are used in contrast to still images, the time dimension gives the producer greater scope to develop the context and to influence the message by looking at the image seqüence.

Increasingly we believe that courseware will be developed collaboratively, as for instance in the COMETT Programme. COMETT II Projects that we are involved in plan to use the communications prototypes discussed here, to gain further experience of communication between the partners in these projects. This aspect of collaboration will become much more highly developed in the future.

Further we believe that a communications network which is capable of assisting the development of courseware is also capable of delivering the courseware to the student. The project started by attempting to design a courseware delivery system, but discovered that this system was well suited to meet problems of communication at the courseware design stage.

Transmission of Images

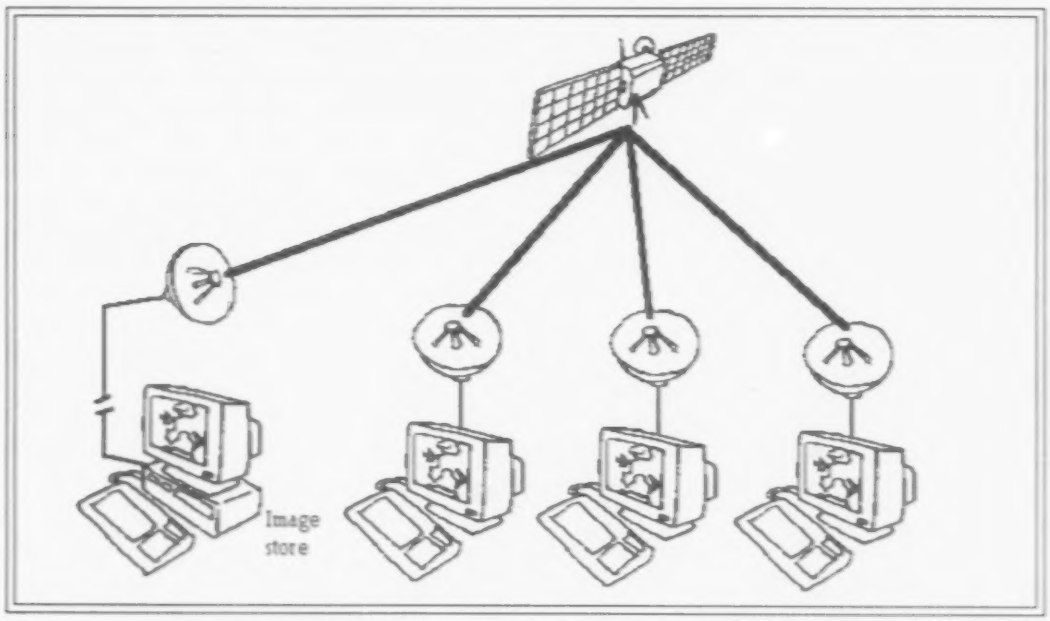
As stated earlier in this paper the emphasis is on the transmission of images and hence we must also give some considerations as to the availability of these images. The project has developed in a practical way the concept of an image store, associated with a database containing information on the stored images. This concept is gaining credence as people realise the high cost of creating images and turn their attention to the advantages of reusing existing images. Commercial companies exist selling picture and video on specific subjects and most broadcasting networks hold libraries of pictures for use in news and current events programmes.

If an image is contained in an image-base then it should be easily accessible on request and then capable of being transmitted to the originator of the request in a reasonable timescale. The request for an

image initially is to examine its content to determine its suitability for the particular purpose. At a later stage the image may need detailed scrutiny as to its quality and detail for final assessment. In the video production field the standard and format of the original images directly determines whether it can be used, as reproduction of the analogue image at some other site inherently results in some loss of the original resolution. Thus the quality of the original image as well as the information content is very important in determining whether use will be made of the material.

discuss production issues were not able to take place.

This project has been concerned to find ways of sending images to specific sites, using the networks described above, either through the metropolitan network, or over a wider area using the satellite. The technique that has been used is to insert address codes in the video signal and when decoded at that address the image is grabbed and held in that terminal. A workstation has been developed where the images are displayed on the terminal monitor, using digital framestores such as the Videologic DVA 4000 system.



Those in collaborative work producing video images, who have experience of the use of postal and courier services to send video tapes across national boundaries know that they are unpredictable, and sometimes can take several days, even within Europe. The need to send images rapidly and reliably, and to be able to hold discussions concerting these images plays a major part in collaborative video production exercises. Our own experience in producing the CAPTIVE video was made significantly more difficult because courier services failed, and conferences set up to

A considerable portion of the work in the project has been concerned with the ability to modify information in the VBI section of the video signal, but this must not in any way interfere with Teletext transmission taking place as part of the basic broadcasting service. The ability to insert data into the video signal and decode it at the remote site opens up a large range of facilities which will play a major part in providing interactive services for training and in other fields. It is possible to send both data and control information through this method and there is much work to be done in the future to control some function of the

student's workstation remotely. This work aims to synchronise the data with the video frame, and should not be confused with data services sending data packets via satellite. The nature of the control is open to much speculation as this can be physical control of devices or functions or it can be more subtle control of the way courseware performs and functions.

The particular concern of the CAPTIVE Project has been to be able to send information to specified workstations using an address code, and to be able to insert data in the VBI portion of the signal possible remotely as well as locally. Obviously there are many possibilities as to the type of information which can be stored in the video signal. The ability to target information to a specific workstation over DBS systems is seen as a very valuable function to enable interactivity for remote learning purpose, and is essential to the function of an Electronic University throughout Europe.

Interactivity can be introduced into the satellite section of the network by a return path using ISDN and other PTT services. The general use of ISDN throughout the whole network would permit great flexibility in the type of data, including images that could be sent back to the head-end of the system. The transmission of these still digital images would of course be much slower than the full screen moving analogue images which can be transmitted over the fibre-optic system and satellite. ISDN can of course be used for the outward transmmision provided the system is limited to still images.
There would therefore be two sets of communications over the PTT networks, the data information used to access data-bases remotely, and the interactive data communication, using services such as ISDN, working in association with the DBS analogue image movements.

Educational Technology

This term applies to the mutual influence of technology on the teachers and the educational environment. In the CAPTIVE Project research has been carried out on several educational topics, just a few will be mentioned. Educational instruction can be delivered in ways ranging from live lectures in universities surroundings to the complex infra-structure of television broadcasts, postal services and regional discussion groups developed for the Open University in the 1960s. The CAPTIVE Project has experimented with existing technology in the form of LIVENET and the OLYMPUS satellite to investigate means of reaching more widely dispersed audiences, and to develop a better understanding of the technical requirements for interactive working using broadcasting and PTT services.

Interactive Authoring and Production

Experience has been gained in the use of audio-confe-mission to distribute images for discussion. The two way audio and one-way video conference can be a very powerful substitute for the fully interactive video conference, and very much cheaper. In some important aspects it is very much more powerful because it provides a full screen moving video sequences, which are not possible with the conventional 2Mbit/sec video con-ference. This medium has been used for the discussion of the suitability of visual courseware material for educational and training purposes. This technique has been used successfully in the development of courseware, both at the discussion and production stages to determine general agreement on the inclusion and sequence of video image, i.e. an "off-line edit" of video material. This becomes very important when courseware is produced collaboratively between partners in European projects and will have its application both in the Exploratory work of DELTA and within the COMETT II projects.

The method is to set up an audio-bridge permitting several communities to talk together. Typically groups extending from Portugal in the south to Norway in the north have been linked, and the audio bridge set up to coincide with live satellite transmission originating in the LIVENET network. Images can be

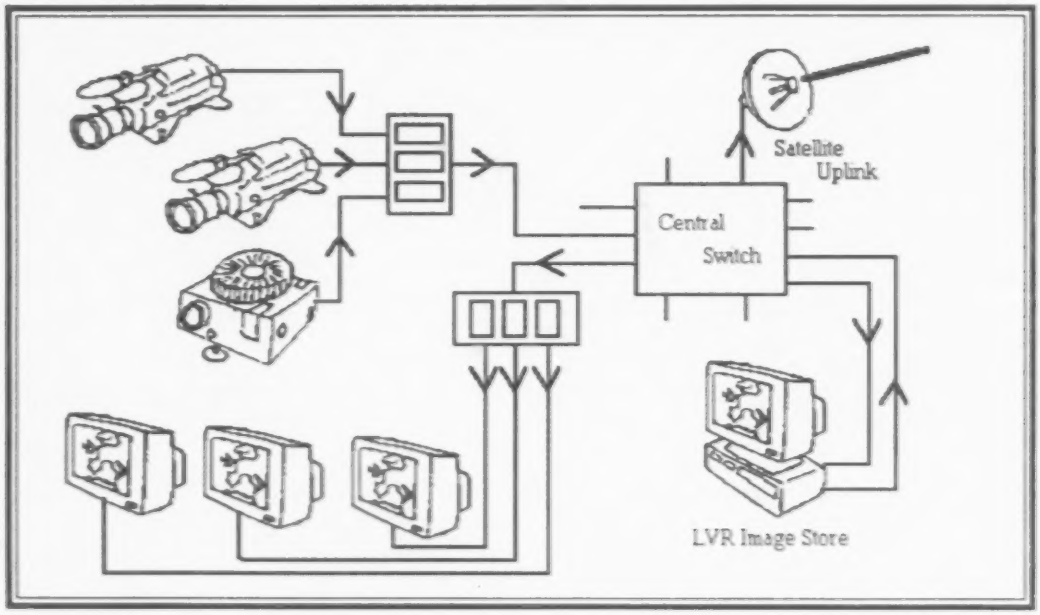
sent out live using the LIVENET network and its link to the Olympus Uplink. The images have been stored on the image base, and under computer control can be selected and transmitted. Images can be either single pictures or sequences of full-screen moving pictures. This system is live and during the satellite session any images can be selected as the discussion progresses, including live camera transmission of people at nodes of the LIVENET network.

Normal practise has been to circulate to all members of the conference information about the images which are available, and then they can request over the audio-bridge that a particular image be transmitted and discussed. This can be a single still picture or video sequences. In the future it should be possible for the image-store to be accessed and controlled from a remote site over the PTT data networks.

Audio conferences of this nature are relatively cheap and can save much time especially in collaborative projects.

2. The design and content of the Video Image Data-base and Image-Base:

The reuse of video material depends upon setting up a sophisticated database, describing what material is available. The data associated with each video film that needs to be stored can be divided into two sectors, firstly the technical information relevant to formats, standards copyright etc., secondly information relating to what was in the mind of the director and producer when this material was produced. To make effective use of the information, the demands of the courseware developer need to be matched against the intentions of the director and producer, and this can be done by the local advisory system. Attempts have been made in the Project to face this problem including the use of Artificial Intelligence techniques. Viewpoints and keywords related to classification systems have been investigated. A prototype has been developed which will form the basis for further work. The scale of work to set up these databases in all the relevant fields is immense but at this stage it is important to set up



the basis of a prototype system. Futher it should be realised that the use of the database and image-base need not be restricted to the courseware developer, but also may be incorporated into the actual courseware itself.

The Project has not only been working on the internal structure of a database, but also has been concerned with external features such as remote access, and the links between the database and its associated image-base. The user interacts directly with the local advisory system, and this system interacts with the database. A query can be assembled and the browsing procedure initiated in the local workstation. There has been a considerable volume of work involved with communciations systems to ensure that the queries can be processed and the answer sent back to the local system. Thus it was decided that there should be some intelligence in the local workstation, which implies a division of computing power with the central mainframe system. The project has shown that it is possible to set up a fully interactive remote facility controlling access to the mainframe.

The prototype image-base has been developed on a WORM (Write Once Read Many) optical disc system. This is an analogue video system capable of storing video images either as still frames or videos sequences, and in various formats including the very high quality component format. Each cassette for the system is capable of storing 34,000 frames per side and the whole system can be controlled digitally via an RS232C connection from a remote workstation. The latency of this system is less than 500 milliseconds. The computer control will provide access to any still frame, and control the playout of a video sequence. The project has made this remotely accessible, and therefore had to provide means of queuing requests. To provide multiple access the system has been developed and implemented using a multi-user, multi-task operating system. This analogue optical disc system provides better quality images than most video disc systems and has the added advantage that images can be stored on the system at any time. It does not require the expensive mastering process of the conventional video disc. The system is sufficiently flexible that it can be used for editing video material and this has been done live in an audio-conference where editing can be carried out with verbal instructions being passed to the person operating the WORM Optical Disc System. A future development would be to be able to operate this device remotely.

It is also necessary to set up PSDN or ISDN communications services linking the database and the image-base so that when images are located which are of interest to the user then a message can be sent to the image-base to arrange transmission of these images over the satellite network to the required site.

Conclusion

This work has shown that there are a very wide range of possibilities to develop interactive communications networks for training purposes. At the present time it is cost effective to work with hybrid networks handling both digital and analogue video images. Further this work has emphasised the value and flexibility of the video image and that if the images generated in computer systems have to be moved around Europe and to reach large numbers of users then the video format is very powerful. The video format can be handled over cable networks and satellite broadcast systems, and satelite is the only way to reach the whole of the European Community at one time.

The work has shown that a database linked to an image base can form a very powerful didactic tool for the courseware developer and much work needs to be done to make the concept of reusability of video material a reality.

There is a distinct trend towards collaboration on a European scale and therefore we need to investigate the ways of producing courseware where the authors and video producers are widely separated geographically. A technique of supplementing audio

conferencing with satellite broadcast of images on demand has proved very powerful and convenient to operate.

Finally I would like to conclude to say that the working on this project has been a very positive experience in which as partners we have learnt much both of ways of our different countries and the way our ideas and thoughts have developed as we have worked together.

D.G. Jameson is by discipline a physicist who has worked in medical physics, computing and now in the application of video and computing projects to teaching and training, from his current position as Director of the Audio-Visual and Multi-media Centre, UCL. The University College Centre is involved in the production of video on a collaborative basis with several centres in other parts of Europe in three different CEC Projetcs. Within the University of London we are closely involved with the LIVENET Project and with the development of video discs combined with intelligent teaching systems for medicine.

Looking to the Future
Options for development of Channel e: the European educational television broadcasting service on the Astra satellite

Philip Crookes
European Institute for the Media

Summary

Since the start of regular broadcasting, Channel e has demonstrated the demand for a pan-European multilingual service of educational and informational programmes addressed to the wider European television audience. Within the framework of the DELTA programme of the EC Channel e has demonstrated its ability to meet this need and identified the medium and long-term options and costs for continuation of the service. Channel e now seeks sources of finance to allow development on a five-year basis to an eventual provision of five hours a day of relevant and necessary programming in support of European educational needs.

1. What is Channel e?

Channel e is Europe's first and only multilingual service of educational, training and informative programmes broadcast by mass-audience satellite.

The programmes are broadcast twice daily, at 0930 and 1200 hours CET, on Transponder 13 of ASTRA, as part of the weekday schedule of RTL-4.

Up to December 31st 1990 Channel e has broadcast almost 200 hours of television programmes on ASTRA, as part of the schedule of RTL4, and a further thirty hours on EUTELSAT F4 as part of the schedule of Super Channel.

Channel e began as an initiative within the DELTA programme of the European Community. The first phase of DELTA will end on March 31st 1991, but Channel e intends to continue and develop its activities both within and outside the continuing EC Framework programme of support for research and development activities.

2. Objectives of the project

During the exploratory phase, supported by a fifty percent contribution of cost from the DELTA programme of the European Commission, the objectives of the Channel e project have been:

* Establishment of educational and informative television broadcasts on the ASTRA medium power satellite to a wide European audience.

* Assessment of effectiveness of the broadcasts in each strand of programming, and a cost-benefit analysis of the programmes within each strand.

* Identification of possibilities for commercial and other sources of funding to support the development of a European multilingual multi-disciplinary open learning television service.

Parallel to these objectives the Channel e team has carried out two studies:

* Identification of databases throughout Europe which could make use of the capacity of ASTRA to transmit data alongside the television signal.

* Research into common accreditation in more than one country for Channel e and other distance learning courses.

Following the exploratory phase, the objectives of Channel e are to maintain and develop the established service, to secure additional funding external to the DELTA programme, to experiment further in areas of language transfer and interactive broadcasting, and to increase the distribution of the Channel e broadcasts.

2.1. The appointment with the viewer

Our decisions on scheduling and presentation have been designed to present Channel e to its audiences as a broadcasting service with an appointment with the viewer: dependable, repeatable and, in the event, desirable.

However, to meet the needs of a continuing professional-standard broadcasting service we have also established the need for much more time for planning, for programme identification and development, and for promotional activities to give the service the impact and value of which we believe it is capable.

This is why we believe it is important for Channel e to continue broadcasting and to build upon the work already done: to link planned programmes into existing teaching schedules and syllabus definitions, and to allow teachers and students, for whom Channel e broadcasting can be a valuable new resource, time to integrate the broadcast materials into their teaching and learning activity.

We believe that it is also important to demonstrate credibility in the eyes of the audience and the providers of programmes by maintaining the broadcast service on a regular and reliable basis.

This view is reinforced by the experience of the first nine months on the air, as a result of which negotiations have become possible with a range of programme providers who have previously been unwilling to commit their resources to what might otherwise have seemed a temporary and transient experiment of limited duration.

In the educational and public sector from which it is likely that a large amount of Channel e programming will come, it is important to allow sufficient time for budget allocations to be made and approved if programming of the desired quality is to be secured. During the first months of our experiment, we have perforce to rely on archive and library materials produced for other purposes: we estimate that a minimum of eighteen months is needed to secure engagement of funds, implementation of production and integration of the broadcast materials into teaching and training programmes in the various target countries.

Who can see Channel e?

- ***By cable***

United Kingdom	*100,000*
Netherlands	*5,700,000*
Luxembourg	*150,000*
Finland	*300,000*
France	*100,000*
Switzerland	*300,000*
Germany	*180,000*

- ***Direct reception (DTH)***

United Kingdom	*1,200,000*
Netherlands	*150,000*
Germany	*700,000*
France	*10,000*
Denmark	*10,000*

We hope that we will be able in the next phase of Channel e broadcasting to plan our broadcasts up to a year in advance, and to undertake further work

along the lines of what is already being done to ensure that the distance learning communities of Europe have every opportunity to make use of Channel e as a part of their available resources.

2.2. The Channel e audience

Channel e measures its audience, and their use of the programmes, in several ways. The audience surveys undertaken in the Netherlands for the host broadcaster provide a valuable starting point, but in addition we take account of viewer response received at the Channel e office, of response monitored by the programme providers themselves, and of response to specific surveys undertaken in connection with individual strands of programming.

It seems likely, from analysis of the sources, that Channel e programmes are watched on average by some 25 000 to 40 000 people each half hour, and that the total cumulative audience over a week of broadcasting is between 250 000 and 400 000, a respectable audience in the crowded and linguistically diverse satellite broadcasting market.

The present universe of European homes able to receive the Channel e programme directly through privately owned dish antennae is a little over two milion; the total number of European homes which can at present receive at least one of the ASTRA signals delivered by cable is twenty-three million. While the potential audience is naturally far greater than the actual audience, we believe that Channel e can provide programmes which meet specific needs of viewers across a wide range of topics.

Moreover, this audience is motivated and is favourably disposed to watching the Channel e programmes: responses to a survey on the Computer Systems strand of programmes indicated that there is a demand for broadcast material, such as that which constitutes Channel e programming, to complement or advance professional skills, and a positive response to the programmes themselves expressed in such remarks as: "useful information", "very important content", "a good supplement to professional training", "useful for the job", "important for myself and good to know".

2.3. Broadcasting to a Mass Audience

From the inception of the Channel e project, our evaluation of the real position of satellite broadcasting in the market, our assesment of the work involved in publicising the programmes, our discussions with programme providers and our early discussions with the then proposed host broadcaster all led us to the conclusion that the originally planned series of programme broadcasts would be insufficient to produce real and replicable results.

We identified at the outset the need to:

* establish a clear identity in the minds of viewers, both private and institutional

* establish an identity in front of the potential and actual providers of programmes, many of whom had already committed resources elsewhere

* establish continuity of service provision and develop the concept of "an appointment with the viewer" which Channel e would reliably meet.

* develop the distribution of Channel e programming both by direct reception and through cable relay to the widest possible audience to allow the maximum breadth of survey to be undertaken

* be in a position to provide broadcast programming on a five-day weekly schedule to meet the market need for "stripped" programming and respond to the unwillingness of satellite broadcasting organisations to accept programmes on an intermittent or discontinuous basis.

These needs clearly mark out Channel e as different from other distance teaching television experiments by satellite broadcasting. Channel e has interpreted its brief as being to provide an open, freely available and widely distributed pan-European service, nourished by its availability on the most popular of

the European television broadcast satellites, its use of the facto industry standard **PAL 625,** and its presence within the programming of established and commited international broadcasting services with wide cable distribution in their target areas.

2.4. Other European satellite broadcasting

Other satellite projects offering training by satellite, most notably Eurostep and Europace are broadcasting via the Olympus and other satellites, to closed user groups requiring particular receiving equipment. Channel e, in developing the post experience and professional training strand of programmes, was the first to offer such a training service to a mass audience without either encryption or the need for specialised receiving equipment beyond the minimum necessary to receive satellite transmissions.

In the case of Europace and Eurostep for example, all programmes are pre-recorded, transmitted by satellite and viewed shortly afterwards at known and identified receiving sites. Courses are accompanied by appropiate support materials and distributed to registered organisations/students in advance. This means that the broadcaster already knows the profile of the audience and the number watching. This simultaneous distribution of the programmes to a known and fixed number of receiving sites is effectively using the satellite as a means of point-to-point communication.

2.5. The Channel e approach to educational broadcasting by satellite

We recognise that educational and informational broadcasting is not a mass entertainment medium, and we have not sought to turn Channel e into a mass-market television service. But we firmly reject the idea that educational broadcasting by satellite is necessarily to be carried on at times of day and using technical systems unavailable to the European public at large.

We have identified two important, but different, approaches to the delivery of educational materials by television broadcast:

point-to-point, in which the satellite is used to transport audiovisual materials to one or several sites already known to the originators of the materials, and **point-to-multi-point**, in which the service is broadcast with the intention of being received in a range of locations, some or none of which may have been identified in advance.

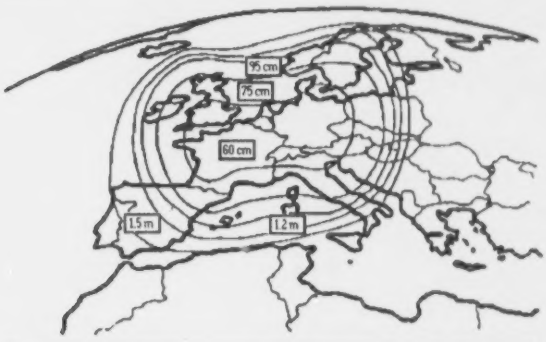
Channel e fits firmly into the second of these categories, both because of its positioning in the developing market of broadcasting by satellite, and because of its stated intention to be available to the widest possible number of viewers to whom the service may be delivered by direct reception from the satellite, by cable relay and terrestrial transmission. All three modes are currently in use in the Channel e experiment.

It has not been part of the Channel e project to demonstrate the practicalities of television transmission by satellite. These practicalities are well understood and established in the commercial and industrial sector, in which de facto standards already exist capable of meeting the need to deliver a dependable service to the viewer at an affordable cost.

We have identified the following considerations as of primary importance in the choice of a delivery platform and transmission standard for an educational multilingual service by satellite.

* Ready and affordable availability of receiving equipment. The minimum equipment, in adition to a domestic television set, necessary to receive the Channel e broadcasts from **ASTRA** costs around 160 ecu, and can be installed by non-technically qualified individuals in around thirty minutes. The equipment is widely distributed through electronic retail outlets, is of proven reliability, and can be sourced from a range of European manufacturers.

* Transmission on a service already available to, and capable of being selected by, the potential audience. Mere geographical coverage is of litle use if the audience is unable or unwilling to tune into the frequencies being used for broadcasting. It was therefore important for Channel e to secure carriage within the schedule of a broadcasting organisation with an international and multilingual purpose, whose signal was available unencrypted and free of copyright restrictions throughout the coverage area.



* Technical compatibility with the existing installed receiver base. This is a more complex question, relating to the fact that ninety percent of receiving dishes installed in Europe at the time of writing are fixed in position (i.e. non-steerable), and can therefore receive only transmissions from the particular satellite towards which they are pointing. The matter is further complicated by the need to equip the receiving dish with an LNB (low-noise block downconverter) capable of resolving the signals at the frequencies and in the polarisation in which they are received.

2.6. The Channel e programmes

During the experimental period, Channel e broadcasts have taken place in five broad strands:

Channel e programmes

Language Studies
Professional Training
Migrant Communities
Youth and Unemployed
European Affairs

2.6.1. Language training

We have so far broadcast three separate series in this strand: a fifteen part series aimed to the general audience and teaching English as a foreign language, a five part series aimed at teachers of the German language and intented to be used, supported by workbooks and printed materials, as classroom and discussion group resources, and a twenty-part series designed as an introduction to the Welsh language.

2.6.2. Post experience training

In the first phase of broadcasting Channel e has transmitted a series of twenty programmes over forty weeks in the series "Understanding Computer Systems", aimed at computer professionals and produced by the FernUniversität of Germany.

2.6.3. Programmes for migrant communities

We have defined migrant communities as consisting of Europeans living and working outside their countries of origin, and have identified the Turkish population in Western Europe as being both the largest migrant group and the most widely dispersed across several countries. From the inception of Channel e programming we have broadcast to this audience weekly programmes of cultural reinforcement and education provided by Anadolou University.

2.6.4. Programmes for young Europeans seeking employment and training outside their own countries

Channel e broadcasting in this area has consisted of twentyfour half-hours, made up of two separate programmes each in twelve European languages, provided by **CEDEFOP,** the **EC** funded Centre for the Development of Professional and Vocational Training. We hope to be able to undertake further programmes in this strand in the next phase of Channel e activity, and have already taken advantage of some programing available from the **EC** itself about the possibilities of living and working in other Community countries.

2.6.5. European Affairs and Continuing Education

From the outset Channel e has recognised the need for a fifth strand under the general title European Affairs, in which we have broadcast programmes of interest to a wide-ranging audience concerned with the development of European policy and the role of the European institutions, as well as programmes of broad interest on health care and environmental issues.

2.7. Results of Channel e broadcasting in 1990

* We have established standards of multilingual presentation and programme scheduling, and have identified the timeframe and cost structures appropiate for future development of the Channel e service.

* We have evaluated the programmes in each strand of the service defined by the Contract, both in terms of their production and in terms of their acceptance by audience.

* We have established and demonstrated the costs of broadcasting in the individual strands and across the range of Channel e broadcasting which allow us accurately to project the activity forward to a second and subsequent phases of Channel e activity, and have identified additional areas of research and development activity based on our findings in the exploratory phase of the **DELTA** programme.

The first nine months of Channel e broadcasting have demonstrated that there is:

* a demand for a quality service of education and information addressed to the pan-European audience

* a desire among European television viewers to be informed about European affairs

* a need for proper arrangements for language transfer to ensure that programmes are equally available to European citizens regardless of where they live or which language they speak

* a real and practical means of distributing European programming using existing and proven technology in the context of entertainment-led television services.

2.8. Specific Achievements

In the first year of broadcasting Channel e has:

* Secured transmission time, playout and uplink services and transponder space by contract, assisted by the partner SES, between the Consortium and the CLT company. We note that the total amount of time and effort in broadcasting hours and technical support secured for the budget expenditure is five times greater than that originally proposed, without impliyng any additional charge to the project budget.

* Started and maintained broadcasting in all four strands laid down in the contract, together with an additional fifth strand of European affairs and continuing education programming, as detailed below.

* Secured, at no additional cost to the project budget, a second outlet for experimental broadcasting using the **EUTELSAT F4** satellite and the services of Super Channel to bring the Channel e programmes to a potential European audience of some 23 million cable-connected homes

* Carried out evaluation of the programmes as broadcast, both from a technical and production viewpoint, and, with selected groups of viewers, from a didactic viewpoint.

* Established the framework of negotiation for cable carriage of the Channel e programmes in the countries covered by the footprint, and secured cable carriage in the Netherlands, Luxembourg, Germany, the United Kingdom, Finland and Switzerland

* Analysed costs of broadcasting in all four strands and over the whole range of broadcasting to provide a clear indication of the costs of continuing the service, the benefits of using the Channel e model for distribution of the materials, and the work needed to continue and develop the service.

* Established technical standards for presentation of broadcast material and identified the areas for study in the presentation of multi-national and multi-lingual programmes of education and information.

The Channel e project is conducted within the framework of an established and growing European television broadcasting industry. To that extent, the technical standards to be used must perforce be those widely accepted within that industry, and for which viewers are already equipped. We can identify no advantage to our viewers and users of the service, nor to Channel e, in adopting standards of transmission or display other than those commonly in use at the present time.

2.9. The choice of broadcast standards: PAL, SECAM OR MAC?

It is well known that the European Commission has sought to encourage the adoption throughout Europe of a common television transmission standard, and has laid down in the Council Directive of 3-11-1986 (86/529/EEC) a requirement for satellites using any of the **WARC** high-power satellite transmission channels to use one of the **MAC-packet** family of standards - specifically **C-MAC, D-MAC** or **D2-MAC.**

This requirement does not apply to the **ASTRA** satellite, which does not broadcast on the channels defined in the Directive, although the transponders on **ASTRA** are capable of transmitting in any currently defined broadcasting standard should the need arise, and two current services on **ASTRA** are in fact transmitted in **D2-MAC** to Sweden for relay by cable operators.

Channel e's eventual transmission standard is that defined by the host broadcasters, but it is important to underline that had Channel e been given a completely open choice of standard, the Consortium would still have opted for the **PAL 625** transmissions currently in use.

We have observed that the existing high power satellites transmitting in the **MAC** packet family of standards have suffered technical problems **(TV-SAT 1, TDF-1 and TDF-2)** which, while not of themselves attributable to the use of the **MAC-packet** transmission standards, have seriously diminished the market penetration of these standards in their respective territories. We have further observed that up to the time of writing the receiver industry has been unable to ensure a reliable and plentiful supply of receivers for the **MAC** packet family, and that, most importantly, their market penetration is trivial in the context of the European satellite broadcasting universe.

By contrast the estimated implantation in Europe of direct-to-home receiving equipment capable of receiving the **PAL** transmissions of the **ASTRA** satellite is of the order of two million units, including individually owned and **SMATV** installations as well as cable headends serving some 23 million European homes (Sources: Continental Research, published in Interspace October 1990).

2.10. Definition of standards for educational and informational programme presentation in a commercial multilingual television satellite environment

Reflecting the results of our substantial work since we began the experimental transmissions of Channel e on March 6th 1990, Channel e has identified and established standards of presentation common to the needs of multilingual educational broadcasting in the context of mass-audience entertainment-led broadcasting services

Questions of presentation in a multilingual television environment have emerged as being crucial to the effective communication of the informational and didactic content of the programmes being transmitted, and the effective information of the audience of what is to be shown, what can be expected, and what further steps the viewer can take in using the broadcast programmes.

In particular, we have identified and responded to:

* production issues relating to the presentation of information in up to four languages

* technical issues relating to the use on the television screen of multilingual captions, the amount of material that can be displayed, the optimal time for material to be held in vision, and the presentation of texts using characters not normally available in the industry standard caption generating machinery.

* communication issues relating to the effectiveness of the various styles and techniques with which we have experimented, taking account of varying viewer response to different techniques and analysis of the cost-benefit issues involved in the options that are open to us.

Our Report, which was prepared using partially resources formerly assigned to the workpackage Post Experience Training and partly to the workpackage Youth Employment,

* identifies the issues involved in presenting educational and informative multilingual programmes in the context of existing commercial broadcasters by satellite

* addresses the meeting of industry standards of technical and presentational format

* sets standards and establishes norms for future use in educational and informational broadcasting in a multilingual television environment.

There is, course, a danger in any project such as Channel e that enthusiasm will lead to attempts to do too much within the available resources, possibly at a cost in less satisfactory performance of the objectives of the project. We believe that Channel e has avoided this danger, but we would not try to conceal the fact that we find the project to be under-resourced in some important areas which will need attention in the next phase of Channel e developement.

The areas we have identified for additional support in cash and in human resources are:

2.10.1. Interactivity

It is widely held among educators that an element of interactivity is desirable, if not indispensable, in distance teaching using television, however delivered. Obviously the use of satellite television, with its multilingual and dispersed audiences, poses special problems, and interactivity with the audience is an area which Channel e would like to develop on an experimental basis in the next phase, initially with the use of a telephone hotline service using "free-call" numbers such as the "green lines" in the Netherlands, or 0800 numbers in the United Kingdom.

Our experience of broadcasting to a multilingual multinational audience on **RTL4** and Super Channel has demonstrated to us that the lead time necessary to establish a viable and practical telephone hotline service is greater than we have available so far, and in consequence we have examined and evaluated the viability of telephone and data link interactivity

related to mass audience satellite broadcasting with a view to creating a real experiment in our next phase of activity.

The primary issues we have considered are:

* the existence of a framework in which the viewer has questions relevant to the broacast material which can be readily asked over the telephone, for answer either simmultaneously from the live studio or subsequently in the same or a later broadcast

* the creation of an audience sufficiently large and dispersed to justify the cost in cash and human resources of undertaking the exercise

* the identification of the languages in which questions might be asked and answered, the practical question of language identification at the time of arrival of an incoming call and the practicalities of ensuring that the answers are available on screen both in the language in which the question has been asked and in other languages in use in the broadcast.

* the identification of a comparative cost structure of setting up a toll-free number in some or all European countries, of setting up a low-cost call structure in some or all European countries, and of setting up a value-added service number (standard call cost charged to the consumer shared with the service provider) in some or all European countries.

* issues of publicity, identification of the number to be called by viewers in different countries and advance promotion of the availability of the service.

* feasibility of inviting direct response by data link (modem and PSTN).

2.10.2. Broadcast management support

There is no point or purpose in broadcasting programmes on television if the audience is unaware of their existence. That simple fact demands the preparation and publication of broadcast schedules well in advance of transmission date. This task in itself, together with the task of responding to viewers' enquiries about Channel e stimulated by the broadcasts and by Press articles, has occupied more time and required more effort than we had foreseen.

2.10.3. Publicity and development

Apart from the published schedule, there is a body of work to be carried out to ensure current and correct listing of the Channel e programmes in the whole range of European television programme guides, information to education journals and relevant professional publications, and liaison with education authorities and training and teaching institutions in the countries covered by the footprint of the satellite. In the medium and long term, Channel e will succeed insofar as the programmes are used and useful to the audiences for which they are intended.

Our experience demonstrates that the task of informing the relevant people and organisations of the existence of the service, and arranging to integrate the Channel e programming into teaching and training programmes which are prepared some months and years in advance, demands full-time attention if it is to be effective. We have managed during the exploratory phase of the project by sharing the tasks out among members of the team, but we believe that it is important in a second phase to give this function a higher profile in the form of a full-time post.

2.10.4. Programme packaging and editing

Channel e does not at present own any technical equipment beyond a domestic quality video recorder, a satellite receiver and steerable antenna, and a television set. Our programme packaging is carried out for us at the premises of Essential Pictures Ltd in London, whose standards and quality have contributed to the professionalism of the Channel e operation over the first year of broadcasting. However, we now

find that the lack of any editing capacity has placed additional strain on the budget resources of Channel e, and has forced us to pay external organisations to undertake work which might better and more conveniently have been carried out in the house. We would wish to see an allocation of capital funds to support a basic level of technical equipment at the Channel e office, to allow final editing and captioning to take place without the need to pay hourly rates in the premises of third party organisations.

2.10.5. Language tranfer capacity

In both captioning and presentational issues, and in language subtitling, we have identified a range of options theoretically open to us but practically unavailable for lack of funds to execute the work. If we had our own captioning equipment, we would be able to key directly the multilingual captions we have set as the standard form of Channel e presentation; similarly, we would be able to prepare texts for computer-based on-line realtime subtitling which at present are desirable but beyond the resources of the project under the present budget.

3. Medium-term options for development

The function of a post-experience professional training strand of programmes such as those broadcast by Channel e is as follows:

* to meet the training and skills updating needs of organisations with offices across Europe. (Eg. Multinational companies)

* facilitate the application of satellite technology for interactive communication whereby members of a particular profession in different countries can link together and exchange the latest information in their field. (Eg. medical, legal and scientific and technical professionals)

* respond to the training demands of home users who require the flexibility of working from home. (Eg. Part-time students, unemployed, women)

The development of a post experience and professional training strand of programming during the initial planning stages of Channel e was also identified as being a type of programming which offered the greastest potential for collaboration with and investment from the private commercial sector.

For Channel e the logistical problems of broadcasting programmes to a relatively unknown audience are complicated by the diversity of professional training needs which exist in a wide range of sectors. The approach adopted by the channel was to disperse its professional training strand of programmes among other strands. Consequently, skills updating for language teachers was coordinated into the language slot, a programme on information technology, which was aimed at personal computer home users, was broadcast as part of the vocational training slot, and computer studies was maintained in the post experience and professional training slot. Details of specific programmes were then publicised in newsletters and industry magazines for each subject area. In this way Channel e has been able to maintain its remit to broadcast unencrypted to a mass European audience.

3.1. Options for the Future

We see our options for the future as being either to:

a) Continue along the lines already established, with a possible extension of hours of broadcast and days of broadcasting to an eventual offer of around fifteen original hours of broadcasting each week, or

b) Develop new relationships, in partnership with other organisations, and possibly using other satellite channels, to provide a total of three hours daily as part of a pan-European service of information and education, or

c) Form a consortium with other interested parties to take full lease of a satellite transponder to carry both Channel e and other desired services, under the overall management of the Channel e service.

3.1.1. Revenue and exploitation projections

At this stage in the emerging satellite industry in Europe, it is unlikely that all operational costs can be covered by revenues. We have however identified the following revenue sources:

3.1.2. Payments by programme providers

Many, though not all, programme providers during the experimental period have paid 12 ecu/minute for transmission of their programmes. Assuming that 75% of programme providers will pay this cost, this amounts to 720 ecu per paid hour, or an overall average of 520 ecu/hour over the whole service, or an annualized rate of 52 times 520 ecu, or 27 040 for each annual broadcast hour. A five hour per week service, identical to that currently broadcast by Channel e, could therefore expect to recover around 135000 ecu from these fees if no programmes are repeated, and proportionately less according to the number of repeats included in the schedule.

3.1.3. Advertising

The market for advertising is limited, and we have not so far received any advertising revenues. This is in part because Channel e as at present constituted has no resources for the sale of advertising time, and has not, therefore, actively sought to sell it during the experimental DELTA exploratory phase. We observe that advertisers in satellite television have in general placed their announcements in popular programming directed to monolingual audiences, although we have noted some multilingual advertisements in the programmes of the dedicated sports channels Eurosport and Screen Sport. We would not however assume significant revenues from this source in the first three years.

3.1.4. Sponsorship

Many programme makers have successfully arranged sponsorship of their programmes by corporations interested in reflecting their participation before the target audience. We believe that this area has strong potential for development, and would expect that after three years some 500 000 ecu/year could be counted on from corporate sponsorships associated with the channel, as distinct from the individual programmes within the service.

3.1.5. Subletting parts of the broadcast signal

This breaks down into two parts:

* Selling portions of the video signal for data transmission, in an activity parallel to teletext services which are at present offered by the host broadcasters. We have established the technical possibility of this activity, but are for the time being hampered by CEPT regulations and other national legislation designed to protect the position of national PTTs. It would also be necessary to establish clearly with the host broadcaster the precise amount of bandwidth able to be sold by Channel e, and meet the technical considerations arising from injection of data signals after the point of playout.

* Selling audio subcarriers. Each channel on the satellite carries with it six audio subcarriers, of which five can be sold off to third party operators for sound or data transmissions. The current market price for such a subcarrier is of the order of 150 000 ecu/year. However, the sale of the subcarriers eliminates the possibility of using them for simultaneous multilingual transmissions. At present Channel e has no access to the audio subcarriers of the host broadcasters apart from the primary sound channel.

3.1.6. Selling time for use by third parties

This option, apparently attractive, assumes that Channel e would contract for more time than was needed to meet the pogramming commitments in hand. In effect we would be selling at retail the time purchased wholesale from the host broadcaster, and assumes willingness on the part of the host broadcaster to allow such sales. We have received a number of approaches from religious organisations for the sale of our time, and also from pharmaceutical companies

willing to pay substantial sums to advertise their products to the medical profession. However, we are dubious as to the propiety of selling time for televangelism, and we understand that the proposals of the pharmaceutical interests are in contravention both of the EC Directive on broadcasting across frontiers, and of national law in the majority of the Member States.

More realistic would be the option of selling time to other pan-European broadcasting activities, and we have held exploratory discussions with officials of the European Parliament and representatives of a putative arts and cultural channel to identify the parameters of such a scheme. We would expect that any such arrangement would take some considerable time to establish.

3.2. Provision of ancillary services

We have reported to the DELTA project our proposals for the development of a multilingual pan-European telephone response and interactivity service related to the daily broadcasting on Channel e. The existence of the hardware and capital plant involved in provision of such a service would allow generation of additional revenues based on selling the service on to other broadcasters and users of broadcasting services as a fully commercial activity.

4. Cost of Channel e broadcasting

We present here three estimates of cost based on different options for the continuation of Channel e broadcasting activities. These estimates are intended to give a very broad outline of the possible cost of each of the options, and as presented do not take account of possible revenue generation. Costs for each item are calculated to include full overhead and on-cost charges where appropiate.

Based on our present experience within DELTA, we can identify certain annual costs as being broadly parallel in all three options, with the main variable being the cost of the actual uplink and transmission. We have assumed in each case that programmes

a) Continuation of the present level of activity of 60 minutes/day

Staff costs for six posts	250 000 ecu
Production, packaging and presentation costs based on live hours/week	50 000 ecu
Translation cost based on 100 hours/year of subtitling at 1 500 ecu/hour	150 000 ecu
Programme procurement	50 000 ecu
Office accomodation and overhead costs, PTT etc	160 000 ecu
Total overhead and fixed costs	660 000 ecu
Transponder rental costs and uplink at present levelof broadcasting (one hour per day)	250 000 ecu
Annual total of all costs: option (a)	*910 000 ecu*

b) Development of a larger-scale service as a sub-lessee of an existing transponder lessee or a lessee of a part of a transponder for up to five hours/day

Staff costs for eight posts	350 000 ecu
Production, packaging and presentation costs based on fifteen hours/week	150 000 ecu
Translation costs based on 300 hours/year of subtitling at 1500 ecu/hour	450 000 ecu
Programme procurement	60 000 ecu
Office accommodation and overheads, PTT etc	180 000 ecu
Total overhead and fixed costs	1 190 000 ecu
Transponder rental costs and uplink for five hours/day for five days/week	1 250 000 ecu
Annual total of all costs: option (b)	*2 440 000 ecu*

c) Full lease of transponder on ASTRA 1b on a 24 hour seven day/week basis, assuming the same level of Channel e broadcasting as Option b

Staff costs for ten posts	450 000 ecu
Production, packaging and presentation costs based on fifteen hours/week.	150 000 ecu
Translation costs based on 100 hours/year of subtitling at 1 500 ecu/hour	150 000 ecu
Programme procurement	60 000 ecu
Office accommodation and overheads, PTT etc	200 000 ecu
Total overhead and fixed costs	1 010 000 ecu
Transponder rental and uplink costs	5 300 000 ecu
Annual total of all costs	*6 310 000 ecu*

would be supplied on pre-recorded tapes to the unlink centre, and have based our costings on the assumption that playout, unlink and transponder costs, including overhead costs, will average 50.000 ecu per weekly hour for one year.

Subletting of the transponder time unused by Channel e would be expected over three years to recover the

transponder rental cost.

5. A Plan for development

Clearly Channel e is not in a position to leap all at once from five hours a week to fifteen. We therefore propose a four-year development programme, building toward a three-hour day, fifteen hours a week, as set out above in **Option b.**

5.1. Stage 1: 1991 to end 1994

*Maintenance of the service on the air at the existing level of one hour per day, five days a week

* Development of medium and long-term use of the Channel e service in formal and informal education throughout Europe, and integration of the Channel e programmes into syllabus planning

*Establishment of commercial profit centres of broadcasting linking educational programming with commercial activities designed to bring additional revenue to Channel e

*Development of cable carriage in additional territories

*Identification of sponsorship and other funding possibilities

*Progressive enlargement of the Channel e offer to a total of three hours/day, on the basis that each hour transmitted brings sufficient revenue both to support itself and contribute to general overheads of the service

*Introduction of targeted encrypted services for subscribing organisations

*Consolidation of the Channel e role as the prime European educational and informational broadcaster

5.2. Stage 2: 1995 and beyond

Securing revenue base sufficient to cover all costs of the service, establisment of common multilingual programming designed for inclusion as resource material in tertiary-level courses throughout Europe.

The possibility of eventually securing a full transponder lease, so benefitting from the commercial possibilities of subletting time to other interested parties as suggested in Option c, can only be evaluated

in the light of the broadcasting experience in three or four years time and the then development of the direct-to-home reception market, the spread of cable systems, and the willingness of cable operators to make bandwidth available to Channel e and other European educational broadcasters.

5.3. Conclusion

In the eighteen months afforded to us so far within the DELTA programme, Channel e has established the practicability of broadcasting multilingual educational and informational programmes to the European audience. No other service has been able to offer its programmes so accessibly to so wide an audience.

We have identified the costs of continuation of the service and established the practical means to offer Channel e programmes to the wider European audience, at home, at work and in institutions of learning.

In the next of Channel e activity it is necessary to establish a more secure and long-term basis for funding outside the experimental support offered by DELTA. We believe that this funding should come from a mixture of public and private sources, and that the commercial opportunities open to Channel e should and can be fully exploited to the point of breaking even at the end of three years.

Philip Crookes, broadcaster, radio and television journalist in New Zealand, Australia and Mexico and United States, worked for 14 years with BBC until 1984. Currently Deputy Director for the European Institute for the Media at Manchester University and Project Co-ordinator of Channel e.

Round Tables

Coming Technologies

Chairman:
Mr. Jacques Babot, CEC, Brussels

Bartolomé Arroyo-Fernández
RACE Central Office
Commission of the European Communities

Abstract

A brief description of the RACE programme will be presented, in particular the main objectives and general structure of the programme. The RACE Application Pilots of RACE Phase I will also be introduced, as well as the plans for Advanced Communication Experiments during RACE Phase II. The experience from the presently running pilots, regarding the adopted technical solutions will also be reviewed. Finally the main issues for future developments will be outlined.

Today I would like to share with you some of the experiences and early results from the RACE Programme, and I hope the presentation will promote an active discussion in this round table on coming technologies.

Objectives of RACE

First, for those of you who are not familiar with the RACE Programme, let's review quickly its objectives.

The RACE Programme, Research and Development in Advanced Communication Technologies in Europe, is now entering its second phase, with a new call for proposals to be launched in the coming months and new contracts expected to start at the beginning of 1992.

The overall mission of RACE is the "Introduction of Integrated Broadband Communications" (IBC) taking into account the evolving Integrated Services Digital Network (ISDN) and national introduction strategies progressing to Community-wide services by 1995.

The main objective, during the first phase of RACE was to explore the technological options. The second phase will look more into the applications with the aim of moving towards the implementation of advanced services within a single European market. The RACE Phase I programme with an overall effort of 1200 MECU, is structured horizontally in three parts:

* Strategies/Consensus Formation
* Technologies
* Applications/Testing/Verification

Vertically the programme is structured into project lines: Network/Switching, Optical Communications, Advanced Information Processing/Programming, IBC Customer Systems and Usability Engineering.

Race Application Pilots / Advanced Communication Experiments

Among the elements affecting the introduction of IBC we can highlight the following:

- Investment in Infrastructure
- Harmonization of introduction strategies
- Standards
- Marketing aspects-who will buy new services and at what price

Some of the elements are closely related to each other. RACE Application Pilots by acting at the user level, will be able to identify the degree of acceptability of the various advanced services and to

provide user qualified inputs to the standardization process. It is hoped that the results in these domains will make a contribution to clarify the picture, regarding to the required investment in infrastructure and the optimal introduction strategy.

Fig. 1 illustrates the range of pilot application projects in RACE phase I. They cover transport, media and

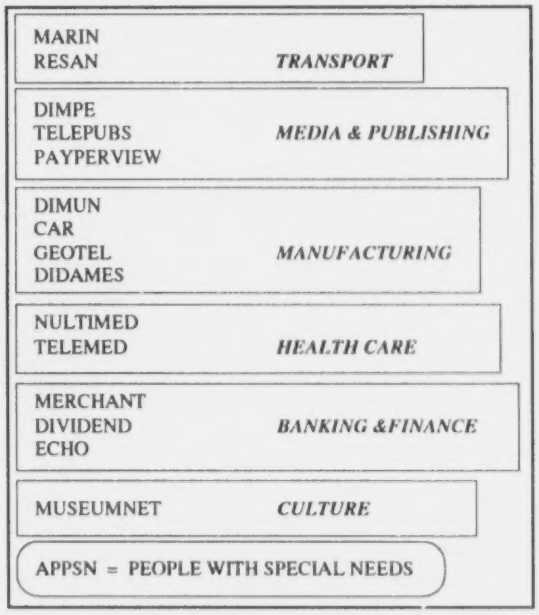


Figure 1

publishing, manufacturing, healthcare, retail and distribution, banking and finance and culture.

Gained Experience

Broadband services are multimedia based, that means the integration of voice, data, graphics, still images and moving images.

The characteristics of each of these services, as regards to the required bit rate and the channel utilization, is shown in Fig. 2. This variety of traffic is to be routed through a universal network through a unique user interface point at affordable cost.

But, why not keep using the existing ad-hoc solutions? This slide shows the telecommunications requirements for a typical session carrying multimedia traffic. Note that only one channel is shown. The required channel bandwidth varies along the session, peak bandwidth allocation for the whole session-as it is done presently-results in the waste of resources and hence high cost. IBCN and in particular ATM - Asynchronous Transfer Mode- will make possible the allocation of just the used capacity.

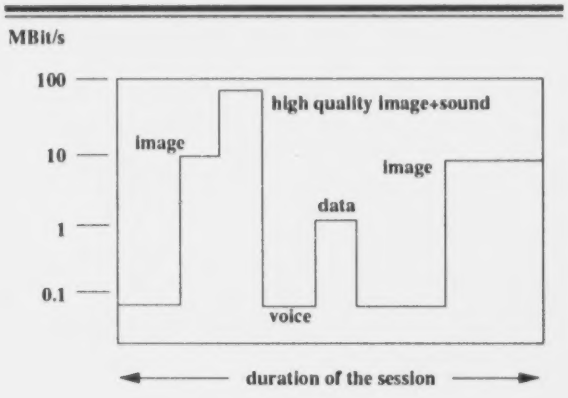


Figure 2

Summarizing the experience from the present application pilots:

• We do identify the requirement for broadband links carrying multimedia traffic generated within multimedia workplace environment.

• We acknowledge the wide use by the pilots of the available de facto standards such as X-windows and TCP/IP.

• A unique common multimedia terminal does not appear to be the solution, most probably different terminals will emerge adapted to the requirements of each user.

• Although digital compression is likely to be widely used for reducing bandwidth requirements, certain

applications -like medical imaging- do not allow an extensive compression of the associated signals.

Advanced Communications Technologies

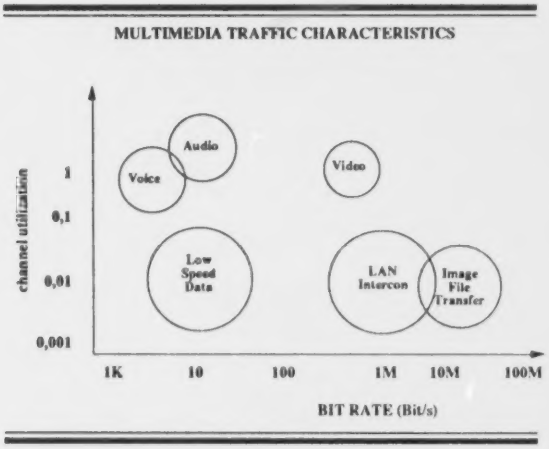


Figure 3

The RACE programme will carry out during its Phase II, cooperative R&D on the key technologies required for low cost realization of IBC equipment and services. To give you a feeling of the coming telecommunication technologies I will list some of the key technological issues to be covered:

• Intelligence in the IBC network, for enhancing flexibility of network provision, management and operation.

• Universal Personal Telecommunication services.

• Mobile and Personal Communication. Evolution to the Universal Mobile Telecommunication System and Mobile Broadband Services.

•Image and Data Communications. Coding, Transcoding and Interworking, HDTV, 3D-TV.

• IBC Systems. ATM technology and interworking, Optical Systems and Networks, Customer Systems, Software infrastructure.

Conclusions

Although the main priority of RACE on its next phase will be on IBC applications -some of the so called "coming technologies" have been with us for a long time but with no actual usage- a strong precompetitive effort has still to be made on the development of the required IBC technologies, in particular in the above mentioned areas.

***Bartolomé Arroyo-Fernández**, Ingeniero Superior de Telecomunicación, UPM 1972, Master of Science, GWU 1976, has a long experience in Satellite Communications, from R&D work at the COMSAT Labs to engineering and operations at Telefónica de España. In October 1989 he joined the DG XIII-F of the EC, and since then he has been involved in the RACE Programme.*

Michel Coomans
ESPRIT Programme
Commission of the European Communities

Workstations. The workstation arena of the 1990's will be characterized by the ability to support multimedia communication and information handling as well as to reflect natural styles of working.

This means a very close integration of technologies that allow manipulation of audio, video, voice, sound, graphics and text with facilities comparable to those available today for traditional media: text and graphics. This will provide computer-based information technology and data processing applications to be enhanced with the use of new, very expressive and friendly media.

IDEAL PLATFORM

PLATFORM = INTERFACES + COMPILERS & LINKERS

PLATFORM MUST PERMIT

- *INTERWORKING*
- *MIGRATION*
- *PORTABILITY*
- *FREEDOM TO CHOOSE*

A partnership relation between the user and the computer will be established and more complexity and performance willl be achieved with ease of use, safe use and robust use at a reasonable price. Features will include among others comprehension, helpfulness and adaptability as well as distributed work environments.

Facilities for the production environment such as tools for the design phase, for digital media production and for hypermedia programming will be incorporated.

Applications areas calling for this integrated multimedia man-machine communication include high end simulations, video post-production, authoring workstations, home PC, promotion, education and training. Key projects in the ESPRIT Programme of the CEC are related with those topics.

Michel C. Coomans is graduated in Mathematics from the University of Brussels (Belgium) and holds several degrees in the management and organisation fields. He spent more than 15 years in the computer industry, in Europe and the USA in the design and implementation of scientific and educational systems, including integrated CBT. He started a systems integration company around local area and high speed netowrks and optical storage technology. He is now responsible for workstation projects and strategy in the "Advanced Business and Home Systems" Unit of the ESPRIT Programme within DGXIII of the CEC.

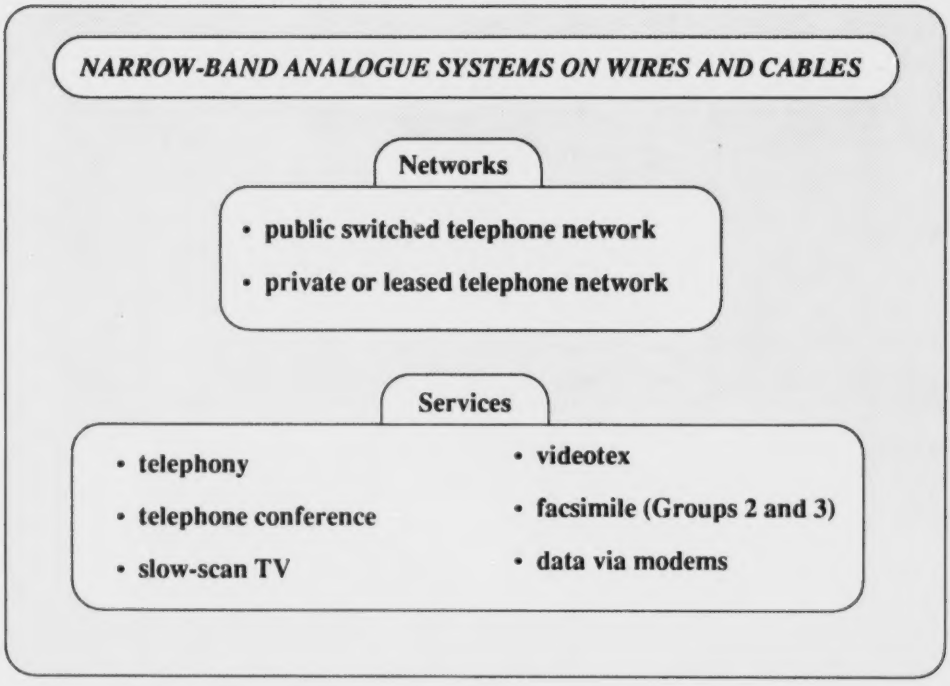
Peter Zorkoczy
Centre for Electronics Education
Open University of the UK

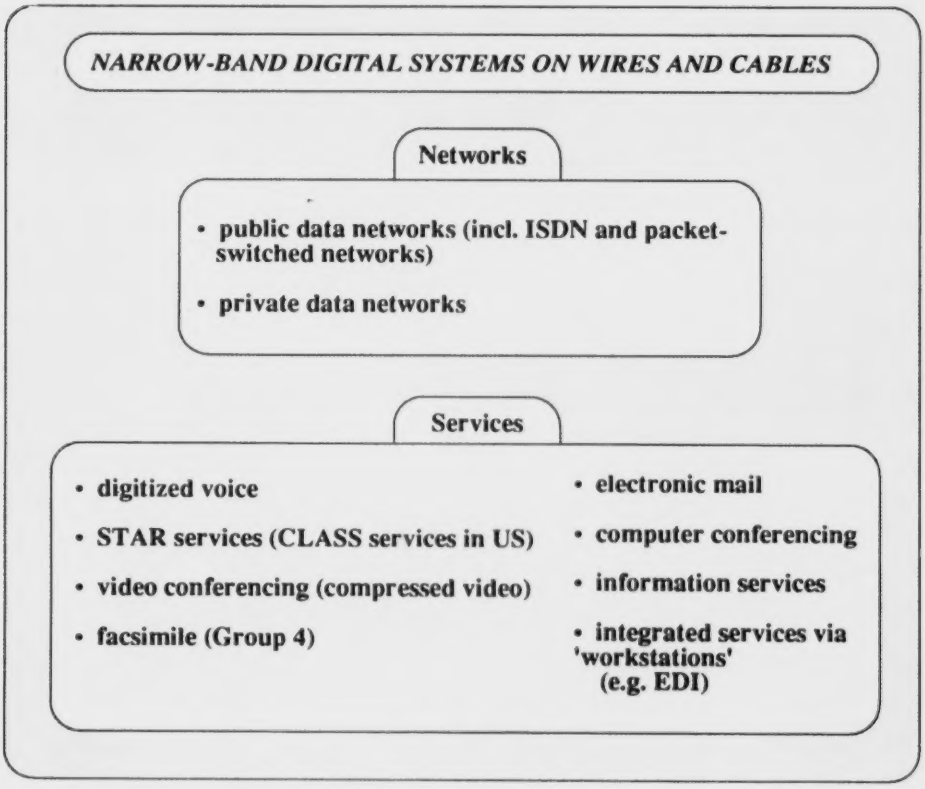
From the viewpoint of technology-based education and training, the most important developments come from the field of telecommunication networks and of services based upon them. These, in turn, are affected by advances in transmission and switching technologies and their rate of introduction into national and international systems.

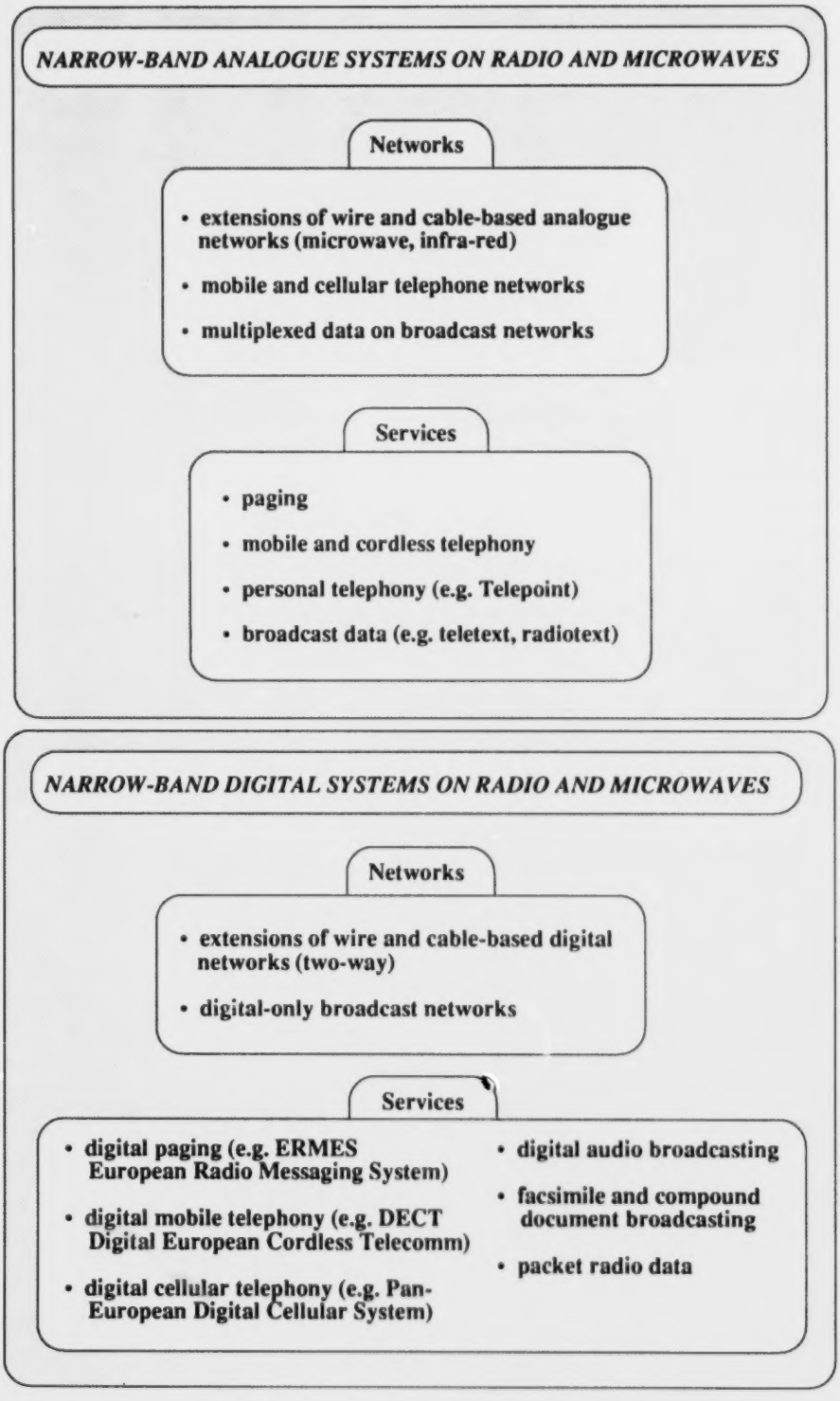
The aim of this brief presentation is to provide a structured overview of coming network and service developments in Europe, some asepcts of which will be explored in more detail in subsequent discussion.

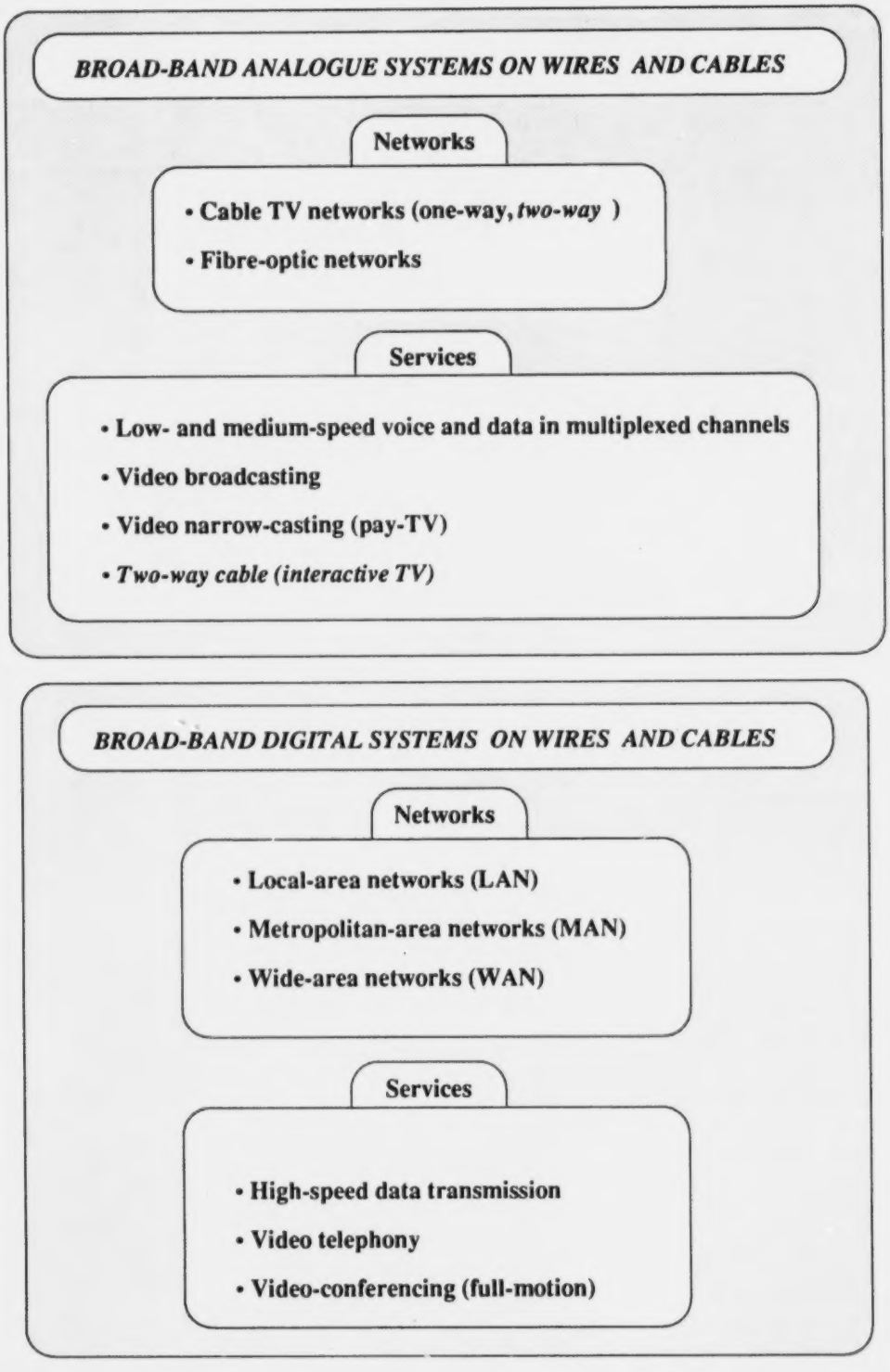
DIMENSIONS

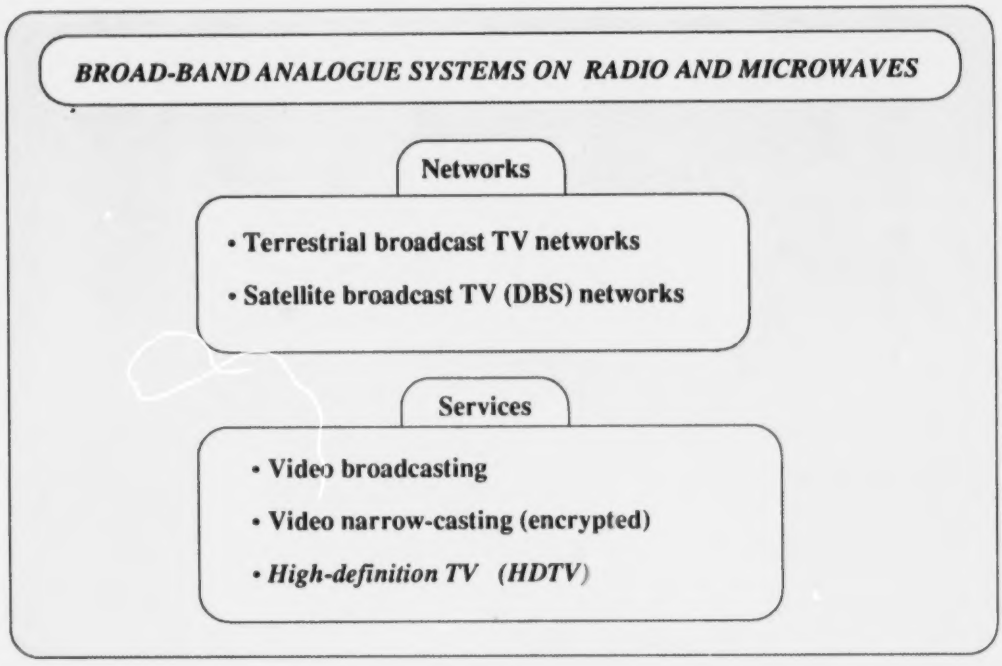
- **BANDWIDTH (Switching)**
  - **Narrow-band**
  - **Broad-band**
- **MEDIUM (Transmission)**
  - **Wires and cables (bounded)**
  - **Radio and microwaves (unbounded)**
- **SIGNAL MODE (Switching and transmission)**
  - **Analogue**
  - **Digital**

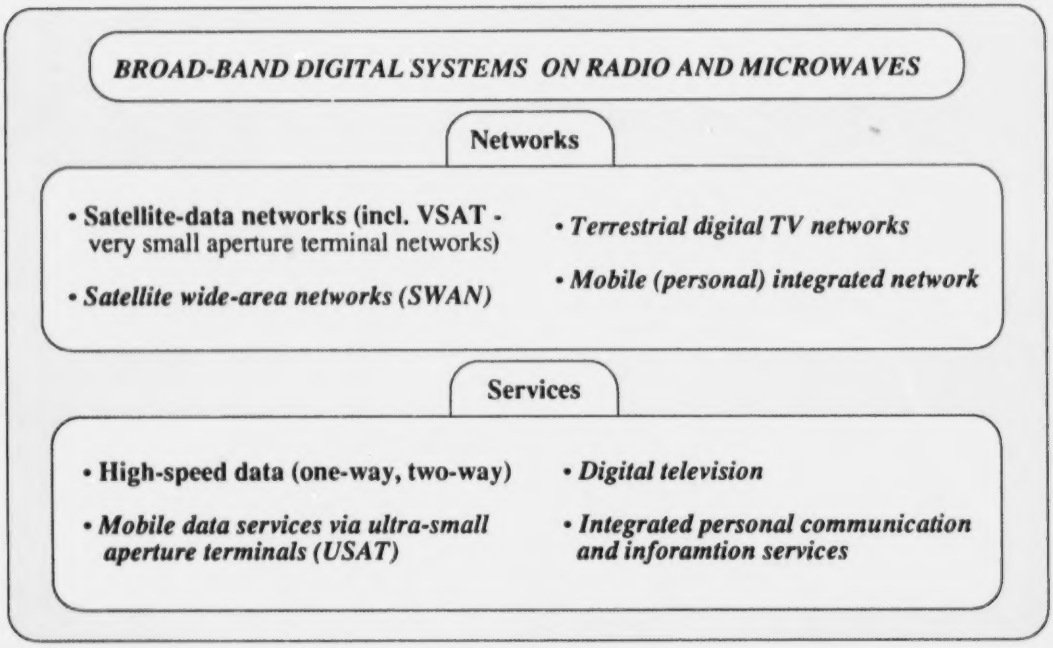

NARROW-BAND ANALOGUE SYSTEMS ON WIRES AND CABLES
Networks
• public switched telephone network
• private or leased telephone network
Services
• telephony
• telephone conference
• slow-scan TV
• videotex
• facsimile (Groups 2 and 3)
• data via modems


NARROW-BAND DIGITAL SYSTEMS ON WIRES AND CABLES
Networks
• public data networks (incl. ISDN and packet-switched networks)
• private data networks
Services
• digitized voice
• STAR services (CLASS services in US)
• video conferencing (compressed video)
• facsimile (Group 4)
• electronic mail
• computer conferencing
• information services
• integrated services via 'workstations' (e.g. EDI)


NARROW-BAND ANALOGUE SYSTEMS ON RADIO AND MICROWAVES
Networks
• extensions of wire and cable-based analogue networks (microwave, infra-red)
• mobile and cellular telephone networks
• multiplexed data on broadcast networks
Services
• paging
• mobile and cordless telephony
• personal telephony (e.g. Telepoint)
• broadcast data (e.g. teletext, radiotext)
NARROW-BAND DIGITAL SYSTEMS ON RADIO AND MICROWAVES
Networks
• extensions of wire and cable-based digital networks (two-way)
• digital-only broadcast networks
Services
• digital paging (e.g. ERMES European Radio Messaging System)
• digital mobile telephony (e.g. DECT Digital European Cordless Telecomm)
• digital cellular telephony (e.g. Pan-European Digital Cellular System)
• digital audio broadcasting
• facsimile and compound document broadcasting
• packet radio data


BROAD-BAND ANALOGUE SYSTEMS ON WIRES AND CABLES
Networks
• Cable TV networks (one-way, two-way)
• Fibre-optic networks
Services
• Low- and medium-speed voice and data in multiplexed channels
• Video broadcasting
• Video narrow-casting (pay-TV)
• Two-way cable (interactive TV)
BROAD-BAND DIGITAL SYSTEMS ON WIRES AND CABLES
Networks
• Local-area networks (LAN)
• Metropolitan-area networks (MAN)
• Wide-area networks (WAN)
Services
• High-speed data transmission
• Video telephony
• Video-conferencing (full-motion)


BROAD-BAND ANALOGUE SYSTEMS ON RADIO AND MICROWAVES
Networks
• Terrestrial broadcast TV networks
• Satellite broadcast TV (DBS) networks
Services
• Video broadcasting
• Video narrow-casting (encrypted)
• High-definition TV (HDTV)


BROAD-BAND DIGITAL SYSTEMS ON RADIO AND MICROWAVES
Networks
• Satellite-data networks (incl. VSAT - very small aperture terminal networks)
• Satellite wide-area networks (SWAN)
• Terrestrial digital TV networks
• Mobile (personal) integrated network
Services
• High-speed data (one-way, two-way)
• Mobile data services via ultra-small aperture terminals (USAT)
• Digital television
• Integrated personal communication and inforamtion services

PERSONAL COMMUNICATION

CONCEPT **Digital cellular radio**

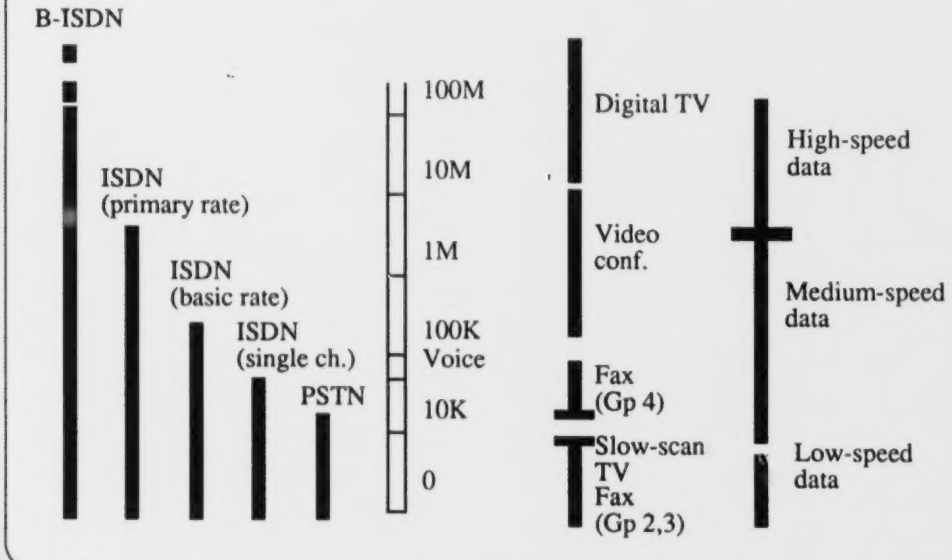
FEATURES **Ability for a person to initiate or receive voice or data calls anywhere, at any time, and at a high service quality**

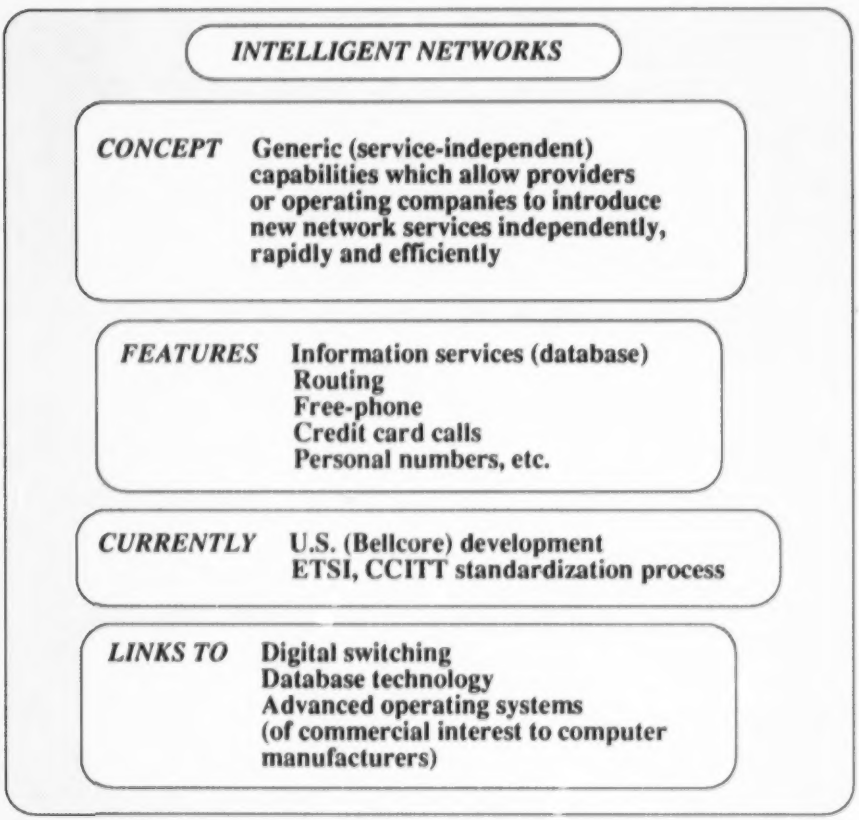
CURRENTLY **Service planned for 1992 (UK) using GSM (Group Speciale Mobile) standards modified by ETSI:**

Digital Cellular System (DCS) 1800 at 1800 MHz, 270 kb/s burst data rate, cells of 1-6 km radius, at low power.

LINKS TO **Fixed (cable and wire-based) network**

" Intelligent network "





Peter Zorkoczy is Director of the Centre for Electronics Education, at the Open University in U.K. He is also Senior Lecturer in Electronic Systems. His main interest is in the application of developments in electronic systems, and in particular in telecommunications, to distance learning. In this context, he participated in the creation of DELTA, Euro-PACE and EPOS.

Implementation Issues

Chairman:
Mr. Rogelio Segovia, FUNDESCO

Dr. Theodor Irmer
Director
CCITT/ITU

I am pleased to communicate with the participants of the TBT seminar in Madrid while physically being still in Geneva; modern telecommunication technology renders such videoconferences nowadays possible and such an event is no longer unusual.

This videoconference you are following right now in Madrid is an interesting example of practical CCITT work. First, it is based on CCITT's main activity which is standardization. Without standardization, no international videoconference would be possible, and the same holds true for almost all other telecommunication networks and services - without CCITT standards, filling at present approximately 19.000 A4 pages, no international telecommunications would be possible.

Secondly, videoconferencing is an excellent means of training which CCITT uses whenever possible. Dealing with standardization of latest technologies and services, we in CCITT are aware of the fact that training of those who have to plan, install and operate such complicated technologies and services is a prerequisite for mastering these tasks successfully. The International Telecom-munication Union (ITU), of which CCITT is a part, recognized the importance of training many years ago and established training material, courses, etc. for all areas of telecommunication. CCITT fully supports these activities; we participate in many training seminars and workshops, we run CCITT seminars on selected topics, such as ISDN, we produce manuals and handbooks as support material in order to teach and understand modern telecommunications. And, as technologies are literally "racing" ahead, training will become even more important than it was up to now; what we learned at technical colleges and universities will soon be taken over by the evolution of technology, and so on and so forth... everybody working in the telecommunication area will have to be a trainee all along his carreer if he wants to keep abreast with the evolution of telecommunication technologies.

We in CCITT greatly appreciate the work carried out by FUNDESCO by arranging such seminars as the present TBT seminar to which I an connected electronically. Let me wish all participants a successful seminar, and I am sure they will benefit from the information provided to them. If CCITT can be of further help, please do not hesitate to contact me and I will attempt to provide any information on our work.

Dr. Theodor Irmer was employed by the Deutsche Bundespost (the PTT Administration of the Federal Republic of Germany) from 1966 to 1984. In his capacity, he held several positions in the area of Digital Transmission and was Project Manager of Network Planning, including ISDN.
From 1972 - 1984, he acted as Chairman of CCITT Study Group XVIII which established, among other things, the concept of ISDN as well as the relevant I-Series Recommendations.
In 1984 he was elected Director of the CCITT, and was re-elected in 1989.

Tim Howell
DGXIII
Commission of the European Communities

There is a growing number of transponders becoming available from existing and/or planned communications satellites with national or regional coverage of Europe which can be used for the distribution of educational information.

The short introductory presentation is intented to cover this element, and to identify how the liberalization proposals of the European Commission, in its November 1990 Green Paper on satellite communications, will affect further this element.

Tim Howell, after a seventeen-year career at the European Space Agency, which included responsibility for mission aspects of European telecommunications satellites at ESA Headquarters in Paris, a spell as Head of the ESA Establishment in Frascati, Rome, and a four-year secondment to the European Commission, now works for the Commission as Assistant Head of the Audivisual Technology and Space Communications Division of the Directorate for Telecommuncations in DG XIII (Telecommunications, Information Technology and Innovation Industries).

Thierry Leclercq
France Telecom

France Telecom introduced the French ISDN, NUMERIS, in 1987 which has now, in January 1991, reached a national coverage.

In 1988 a partnership policy was started to help customers, developers and service providers to appropiate this new communication tool.

Obviously, several of the new applications concern remote teaching and connection of microcomputers based learning systems.

We have observed during the last ten years the development of videotex use for distance learning but we can say that now ISDN is one of the main platforms to develop training systems in France.

The interesting points of ISDN are:

- the bit rate, 64 kbit/s, which allows to load ten times more information than analog telephone networks in the same time and for approximately the same price

- the national availability, and the increasing number of PBX which will be naturally connected to ISDN, giving a close and shared access to ISDN to training systems

- the complementarity with microcomputers. Every day it becomes easir to connect ISDN and microcomputers to send or receive softwares, or photos, texts or multimedia documents

- the new teleservices: high quality sound (7khz), the videophone, the videoconference, that give great perpectives to remote teaching

- the switching, that allows individual programmes

- the price of ISDN, which is no longer obstacle to the diffusion of TBT

Although most of the applications are now just in their trial runs, we can be sure that some of them will soon be fully usable long before the commercialisation of broadband ISDN, and that ISDN will take a significant part of distance learning traffic.

Thierry Leclercq is in charge of Marketing of Digital Network Applications and, more specifically of ISDN applications at FRANCE TELECOM Commercial Division. He was responsible for Partnership Policy to promote ISDN Applications in 89-90 and Product Manager of Pre-ISDN Network TRANSCOM in 87-88.

Norbert Maassen
Deutsche Bundespost Telekom

1. ISDN Activities of DBP Telekom

In order to reach a large number of potential ISDN customers as soon as possible, commercial operation of ISDN has been launched at eight focal points of the national network in early 1989. According to present plans, the ISDN network comprises more than 135 cities with 290 digital local exchanges in 1990, nationwide coverage will be achieved at the end of 1993 in the western part, till 1995 in the eastern part of Germany.

The nationwide offering of ISDN services is to be seen independently of the complete digitalisation of the existing local exchanges. The DBP Telekom also wants to enable customers who do not have direct access to a local exchange with ISDN capability to use the ISDN services in the near future. These customers will initially be linked to the nearest ISDN local network by means of a "remote-access".

In accordance to the commercial opening of ISDN the DBP Telekom has started the promotion and development of ISDN applications cooperation with the users, manufacturers and consultants. Up to now, 22 cooperation contracts have been signed with partners in various business sectors, comprising the total "bandwidth" from local to nationwide applications. Actually the first international cooperation projects are being prepared. As a promising example the applications project "Interactive Remote Training" is explained by the charts in point 4.

Furthermore, the implementation of ISPBXs and ISDN PC-boards combined with the subscription of a basic rate access will be promoted till the end of March 1991.

As signatory of the Memorandum of Understanding (MoU) the DBP Telekom will gradually introduce the Pan-European ISDN, starting in 1992.

In order to guarantee maximum planning security as well for the customers as for the manufacturers of terminal equipment, the European ISDN will be offered in addition to the existing network. As far as the D-channel-protocol is concerned, both the national protocol and the European version will exist side by side. In relation to the:

2. User-Network Interfaces

the DBP Telekom has developed the following concept:

- the basic accesses, as far as they are bus-configurated by the S-interface, will provide both protocols simultaneously;

- in the cases of primary rate accesses and basic accesses connected to ISPBXs either the national or the European protocol will be offered.

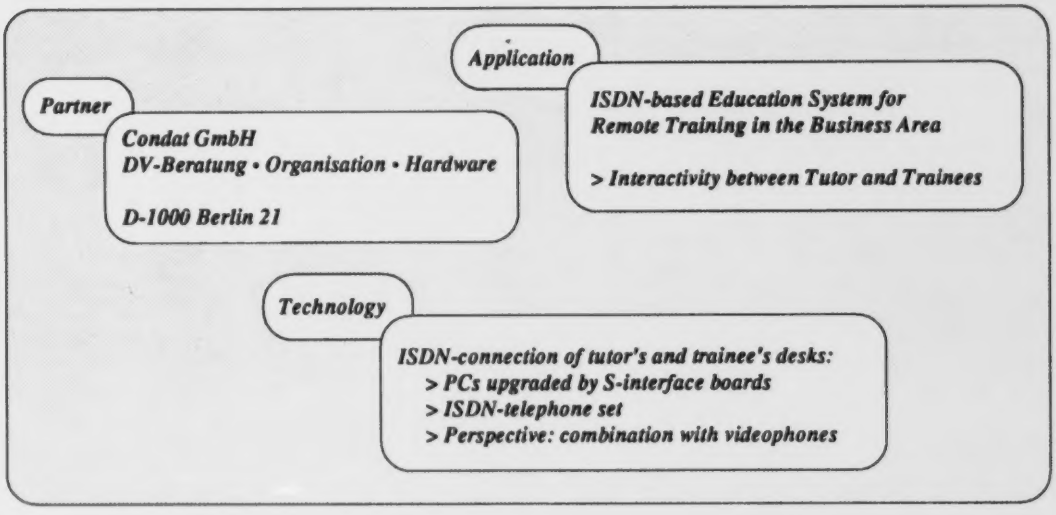
This proceeding ensures that different terminal equipment can be constructed to the same access. For this reason neither the potential customers nor the manufacturers of terminal equipment have to wait for the "final" protocol.

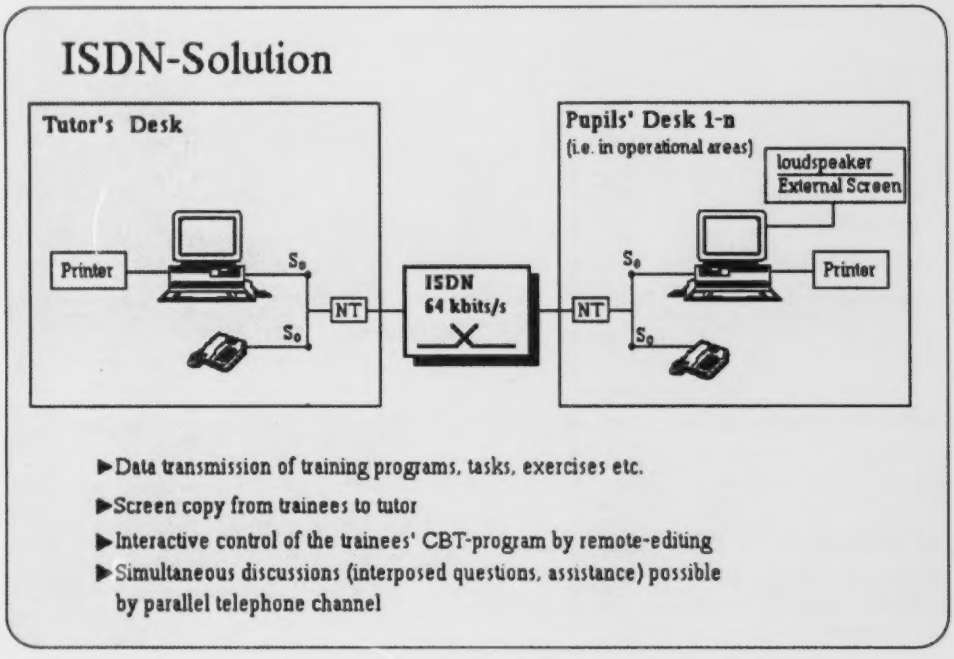
3. International Interconnections

The following interconnections are realized or scheduled:

• The Netherlands	1989
• France	19.11.1990
• United Kingdom (BT)	17.12.1990

• Japan	approx. March 1991	**4. ISDN-Application Project "Interactive Remote Training"** (see charts below)
• Denmark, Italy	summer 1991	
• USA (AT&T)		


Application
ISDN-based Education System for Remote Training in the Business Area
> Interactivity between Tutor and Trainees
Partner
Condat GmbH
DV-Beratung • Organisation • Hardware
D-1000 Berlin 21
Technology
ISDN-connection of tutor's and trainee's desks:
> PCs upgraded by S-interface boards
> ISDN-telephone set
> Perspective: combination with videophones



ADVANTAGES

> ***Improvement of training results by interactive communication between tutor and trainee***

> ***High-tech training system at low network costs***

> ***Independence of location using public ISDN and existing in-house networks (i.e. PBX, LAN)***

> ***Implementation of standard hardware and existing application software (Computer-Based Training Programs)***

> ***Easy adaptation to individual requirements by modular concept***

Norbert Maassen is currently working on the promotion and development of ISDN applications at the SOFIA (Special Office for ISDN-Applications) of the DBP in Berlin.

The Use of TBT in Telefónica

Antolin Velasco
Telefónica de España, S.A.

1. The Situation

Telefónica is the most important telecommunications operator in Spain. At the end of 1989, Telefónica had 11.8 million lines, 71.797 employees and a volume of business of 716.000 million pesetas.

The demand for training has increased enormously during the last 5 years. Using professor hours as a parameter, we have increased from 90.000 hours in 1986 to 400.000 hours foreseen for 1991. During this year we plan to conduct 16.250 courses with 147.700 students and 4.300.000 student hours.

Our estimates are that the demand for training programmes will continue to grow and in 1995 will be greater than 5.600.000 student hours.

The factors that determine this great increase are shared by other telecommunications operators and the most significant are:

- The increase in services offered. As well as telephone service, there is data transmission and switching, mobile telephone, paging service, Ibertex, telefax, videoconferences, etc.

- The new framework of regulations after the enactment of the LOT (Ley de Ordenación de las Telecomunicaciones - Telecommunications Regulation Law) in Spain and the liberalization process being promoted by Brussels.

- A new framework for labour taking into account new labour groups in charge of new activities that must be learned and therefore require training.

- Greater interest in training on behalf of social agents.

- An acceleration in technological change which brings about a massive introduction of new equipment (more than 200 different types yearly) to the worksite and with a shorter life span.

- The incorporation of new telematic systems to aid work that involve learning the use of new tools.

2. The Training System in Telefónica

In order to meet this demand Telefónica is introducing a Training System along these major lines:

- Participation of all agents

- Coordination between planning and innovation

- Active processing of training demands with supervisors acting as planners and teachers

- Centralized course planning and designing and decentralized teaching (50 provincial schools and 1 central school)

- The training is carried out by collaborating teachers (employees of Telefónica who are not professional teachers)

- An increase in training possibilities

- Growth in the integration of technologies

- Simplification and mechanization of procedures

- Bring training to the worksite (self-study, IT)

At present, the great majority of these training needs are resolved by the classic "Teacher, book and blackboard" method with the participation of about 5 000 collaborating teachers that conduct approximately 700 different types of courses in all provinces.

3. Technology Based Training

With these facts, Telefónica's Management is firmly determined to use these technologies as tools to aid the training system and has the following objectives:

- Improve the quality of training. The integration of quality equipment such as videos, CBT, videodiscs, etc. in conventional training, improve the teacher's pedagogical level and therefore improve the quality of training.

- Bring training to the worksite which results in meeting the needs of the person in relation to his job and also reduces costs.

- Start self-training programs at the basic training level, required in order to enter the Company and for some training courses.

We can divide TBT in Telefónica into three areas:

- **Video**
- **Computers**
- **Telecommunications**

Video

Lineal video is not precisely a new technology. However, we would like to point out that for us it is of great importance and utility. It is relatively cheap, accessible to both students and teachers and easily integrated by designers.

Video is widely used in Telefónica in many types of courses, especially in those where it is necessary to teach manual operations and to describe equipment.

Videodisc, the use of video combined with computer, is still in an experimental stage. We believe that it is an instrument with great potential although quite expensive at the moment.

Finally we have the combination of video and telecommunications which are videotelephone and videoconference. We have no experience with videotelephone at the moment but hope to begin soon when the use of ISDN, on which it is based, becomes more common. We have had some experience with videoconferencing and consider it a very useful and interactive tool for training. Its greatest drawback is the cost of the equipment.

Computers

Here we refer to the use of computers as tools that make learning easier and more concretely, to computer based training (CBT).

We have two basic experiences in this area: one based on a large centralized computer and the other based on microcomputers.

Telefónica's Information Center has a section dedicated to assisted training which is accessed to by X-25 switching packages on the public network. This section has a series of courses, basically about computers (FOCUS, SUPERNATURAL,etc.) that are accessible on-line. These courses are available to the persons connected to the Information Center and are usually used in the self-training programs.

Telefónica has been developing CBT courses for microcomputers and the Network for approximately the last 5 years. These courses are distributed on diskette accompained by a user's manual.

Experience has shown us that for an optimum use of these courses they should be used in the presence of

a teacher to introduce the lesson and solve problems that may arise.

Telecommunications

We have the following experience in the use of telecommunications in training:

- Distance learning courses based on books and complemented with tutoring by telephone.

- Use of ARGOS, the teledidactic system that consists, in short, of a teledistribution system of CBT courses. This system has "central storage" based in Telefónica's Information Center and is accessed to by friendly software loaded in microcomputers and connected to the Host by X-25. This system permits any of the Center's courses to be transferred to local environments.

- The EuroPACE system that as you know consists in teledistribution via satellite in cooperation with European companies that develop high level Information Technology courses on video that can be either seen directly or recorded. This system is complemented by telematic tutorship based on electronic mail. At present, Telefónica's major schools have antennas.

4. Conclusion

Telefónica is determined to give an impulse to the use of these technologies in training. Not because this is in vogue, but because we consider these technologies as fundamental instruments to satisfy our needs and volume of training at a reasonable cost. In line with this, we are participating in the EPOS Project, about which you have already heard. We have high hopes in the EPOS Project, not only to fulfil our needs but in order to offer a quality Value Added Service to the Spanish society that will help to reduce the serious deficiencies in the educational aspect that this country has.

Antolín Velasco holds a degree in Telecommunications Engineering and a Master in Human Resources. In 1975 he joined Telefónica where he has held various positions, and was appointed Deputy Director of the Department of Training in 1988.

Practical Demonstrations

Organisational Learning Enterprise (OLE)

Teacher-Learner Station

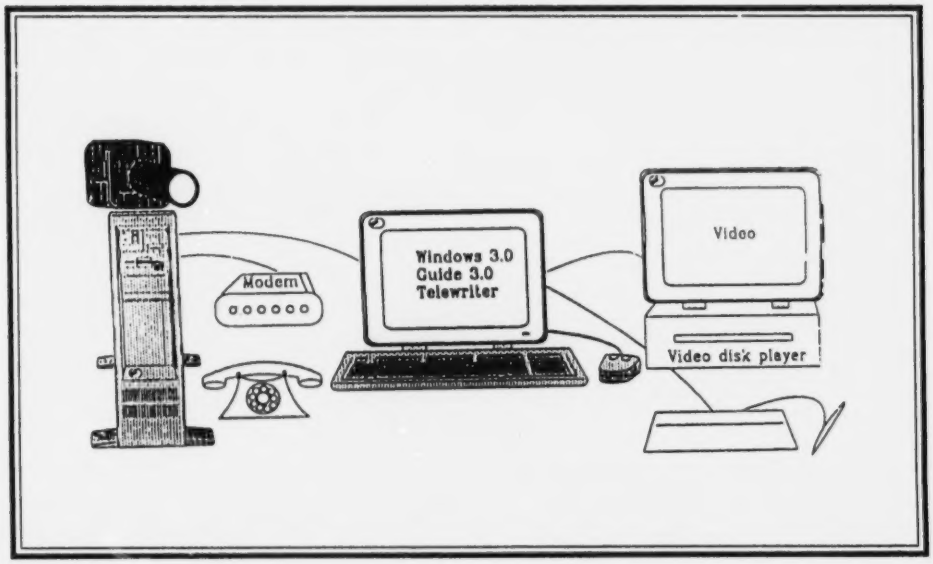
At the Madrid seminar the teacher-learner station was demonstrated. Demonstrated was a teacher learner station, with still and live video images, text material and a complete course information base. The teacher learner station was connected to a conferencing service (EIES-2) in Denmark through modem, and it was connected to ITAI in the southern part of Denmark through a still image picture phone. A series of pictures and annotations was transferred between Madrid and Denmark on standard telephone lines.

The following facilities of the teacher-learner station was demonstrated:

1) easy access to images stored on hard disk;
2) easy access to live video from video disk;
3) a digital voice card providing speech synchronisation in different alguages of the video disk;
4) a complete course information base implemented in hypertext;
5) easy access to a conferencing system, allowing written communication with other learners and the teacher;
6) a picture phone, providing still image communication through standard telephone lines.

Discription:

The Teacher-learner station contains a GUI based hypertext userinterface, running on a Intel 80386 PB. The PC is connected to an external high-speed mode,



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which is the basis for conferencing and image transfer through the picture phone. An video disk and an image database are included. A standard phone is used for speech.

Hardware Components:

1) 80286 based IBM-compatible PC with an EGA monitor;
2) Philips videodisk;
3) SONY KX-14CP1 video monitor;
4) OPTEL Telewriter 3.TAG with digitizer;
5) Telebit Trailblazer 2000 modem;
6) a standard telephone;
7) a standard composite video camera with VCR;
8) a DVC digital voice card.

Software Components:

1) MS-DOS ver. 4.01
2) Microsoft Windows 3.0
3) OWL Guide 3.0
4) Hypertext applications developed in Guide 3.0
5) Telewriter software

Bente Lausch
Aarhus Technical College, DK

Collaborative Authoring Production and Transmission of Interactive Video for Education (CAPTIVE)

Interactive Satellite and Audio-Conferencing Demonstration

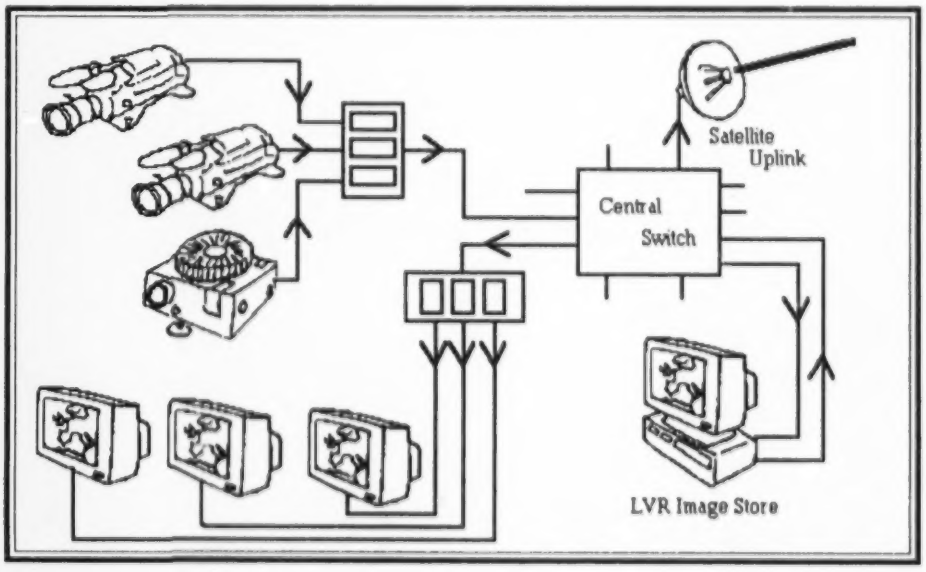
A demonstration was set up between the following centres:

Telefónica	Madrid	Spain
University of London	London	U. Kingdom
Rogalandmediesenter	Stavanger	Norway
Katholieke Universiteit	Leuven	Belgium
Riksuniversiteit	Groningen	Netherlands

The demonstration permitted the video producers in the above five centres distributed widely throughout Europe to discuss interactively features of video production. The discussion took place on the telephone by audio conference but was supplemented with visual material transmitted using the Olympus satellite.

An audio discussion via a conferencing bridge was booked for one hour to coincide with the satellite transmission. The video material for transmission was stored in an image store located at London University. The image store and the uplink to the Olympus satellite are nodes of the LIVENET interactive fibre-optic network for teaching in the University of London. This network permits live transmission on the Olympus satellite from any node of LIVENET.

The image store consists of a Sony Laser Video Recorder Optical Disc store with ability to store 36,000 images with an access time of less than 500 milliseconds. The images can be recorded as still single images or video sequences, from a video device such as a camera or video tape recorder. The system does not require mastering as in the case of videodiscs. The individual images or video sequences are identified in the controlling computer system and the moderator of the conference can call up any image or sequence from the image store by a keypress as required. At the present stage of development



the moderator is necessary but shortly the participants of a conference could call up images themselves through a PSDN link into the computer controlling the image store.

There were two categories of images; firstly the images under discussion, and secondly photographs of speakers or locations which can be displayed while discussion takes place which may not directly require an image on the screen. The moderator and the chairman of the discussion can be the same person as required. Our experience is that the discussion is easier to lead if the participants are known to each other.

The discussion in this conference was concerned with the use of animation and graphics in video, and the participating producers were discussing examples which were included in recent productions from their centres. The examples of the video material were shown, contrasting styles of animation and graphics, the problems of mixing graphics coming from several different sources when production is the result of collaborative effort, and the success of the animations in putting over the desired message.

D.G. Jameson
Director of Audio-Visual and Multi-media Centre
University College London

Learning by Advanced Telecommunications

(LAT)

An international video conference was held at "Focus Zentrum" in Berlin on 22 January 1991 where two national in-house further training courses in Madrid and Berlin were linked via satellite for the first time to create a "European classroom" - the trainer taught his class from a France Telecom video studio in Paris.

Objective:

Within the framework of the European research project DELTA (Developing European Learning Through Technological Advance) three companies - CONDAT, EAP European School of Management and Berlitz International - are developing models for distance learning based on the concept of "Learning for Europe" which aims to promote the international exchange of training courses.

In addition, tests will be carried out to put to the test joint and simultaneous training for course participants in different European countries using satellite linkups.

Background:

Employees at General Electric and Endesa in Madrid attend a Berlitz course with weekly lessons in business English.

A group of employees at Gillette in Berlin is also completing a similar course. The aim of these courses is to enable participants to communicate effectively in international business circles. This is one element of the core training plan, e.g. training for intercultural meetings.

In communication training, role plays are usually conducted within the limits of one national training group. But by bringing together training groups in various countries, the "European classroom" now adds a dimension of authenticity to these situations, making them just like the real thing.

State-of-the-art telecommunications enable us to bring together groups in different countries so that they can train together and achieve high levels of competence in dealing with international colleagues and clients in their "true-to-life classroom".

Outlook:

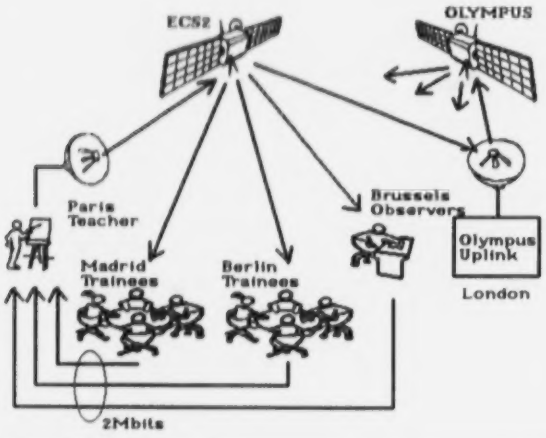
Since 1988 CONDAT, EAP and Berlitz have enjoyed great success in the European research programme DELTA.

The video conference on 22 January 1991, which formed part of the DELTA TBT-Seminar in Madrid, brought the three partners' initial stage of research to a close.

We are now preparing for the main phase of the DELTA programme which begins in the autumn of 1991.

In our future work we aim to implement and put to the test extensive European training courses with the aid of state-of-the-art telecommunications technology.

Berlitz is planning to set up a European Electronic Language School which will provide a new, efficient training programme relating to the workplace with particular attention devoted to international personnel development systems.



Leopold Reif
Product Development Manager
Berlitz

Evaluation

Mrs. Lieve van Langenhove, CEC, Brussels

Comments on evaluation
Lieve Van Langenhove
(DELTA)

The experiment demonstrated the possibilities of different didactic strategies with different levels of interactivity at a distance:

- one-to-many, broadcasting model: a video demonstrated the possibilities for negotiation between 2 cultures;
- many-to-many, seminar model: simulation of a contract negotiation between the Madrid and Berlin students;
- one-to-one, tutoring model: feedback from the tutor and interaction on the video and simulation exercise.

As such videoconferencing was shown to be a value-added technological means for learning at a distance between different sites and groups of students as well as a valuable tool for new pedagogical ways of learning and teaching.

Positive contributions:

- active and in realtime interaction without constraints;
- training of subjects which needs the presence of others (group learning, language, interpersonal skills);
- multimedia demonstrations and tutoring at a distance and in a flexible way.

The LAT demonstration was not only fruitful in showing the possibilities but also in revealing the issues which need more research and development.

Some critical points during the video lesson are:

- the uneasiness of the learners with videoconferencing and technologies;
- the overwhelming effect of technology on the learners as well as the teacher;
- the lack of flexibility to interact when the learner wanted (too few microphones, only one mobile camera);
- sound quality;
- the interchange between the technological possibilities and the pedagogical design and use. Teaching strategies were not sufficiently adapted to the new technical means and as such the rich interaction possibilities were not fully exploited.

Closing Addresses

Closing Session

Via Video-Conference and Satellite Transmission

Chairman: Luis Rodriguez Roselló
Head of Unit,DELTAProgramme, CEC

Coordination Paris: Jacques Babot and Lieve Van Langenhove
DELTA Office, CEC

Participation: Aline Tarago, FRANCE TELECOM
Roger Seïté, MRT France

Coordination Brussels: Corinne Hermant
DELTA Office, CEC

Speakers: Joan Majó
Conseiller hors Classe, DGXIII, CEC
Roland Hüber
Director, Directorate DGXIII-F, CEC

Madrid

Speakers: Juan Rojo
Secretary of State for Universities & Research, E
Javier Nadal
General Director of Telecommunications, E

Berlin

Participation: Dr. Hans Six, Fernuniversität Hagen, D

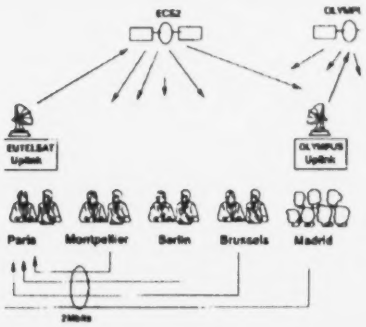
Technical Production: Pierre Bonjean, FRANCE TELECOM
Technical Coordination: J. Pierre Lloancy,
Realisation: Paul Boujean,
Technical Team (Light, sound, etc.): VIF, Paris and the team of TELEFONICA (Spain), Deutsche Bundespost (Germany) and CEE Brussels (Belgium).

The closing session was broadcast in business video through the ECS2 satellite between Paris and Madrid, Brussels, Montpellier, Berlin.

The feedback was given from these 4 towns with the videoconferencing circuits at 2 Mbits.

This configuration is usualy used by FRANCE TELECOM for their in house distance training, specialy between France and the oversea department (known under the name of VIF*).

The whole closing session was also braodcast on the Eurostep transponder of OLYMPUS (DBS satellite), which can be received all over western Europe.



During the first part (30 Minutes) DELTA was presented by Lieve van Langenhove and Jacques Babot specialy for the OLYMPUS users. A serie of video clips prepared by each project was used to illustrate this part.

The German and French representative (Mr. Six and Mr. Seïté) of the DELTA Management Committee had the opportunity to comment on the DELTA approach.

Mrs Aline Tarago, representative of the international department of FRANCE TELECOM, gave a short address to state the uptake for FRANCE TELECOM of the collaboration in the research programme of the DG XIII in specialy on distance learning through DELTA.

* *Videocom Interactif de FRANCE TELECOM*

Joan Majó
Conseiller Hors Classe
DG XIII
Commission of the European Communities

We at the Commission are convinced that the combined activities of training, learning and education are probably the key factors for the future of Europe, both in economic growth as well as the improvement in the quality of life. We can see that the coming years will bring with them new and revolutionary concepts in the fields of education and training. However, probably one of the most important differences at present between us and some of our major competitors, from an economic point of view, is the importance which has already been given to continuous training and adult education.

Bearing in mind this situation, it is clear to us that the future must bring with it radical improvements on all fronts: an increase in the amount of learning and training as well as a greater efficiency in these areas. Otherwise, the financial burden will be so great as to hinder and possibly impair the technological advances. We must, therefore, look towards cost-efficient and effective technologies and systems which, based on new approaches, will encompass the maximum of knowledge output in the training activity.

We are convinced that the roles which information and telecommunication technologies can perform in this area will be one of the issues which will permit the afore-mentioned increase and subsequent exploitation of the efficiency in training and we strongly support any and all actions focusing on this domain. As stated before, the final goal is firstly, to improve the development of the Community as well as the various countries and, secondly, to enrich and enhance the quality of life of everyone and it is up to the national Governments and the Community to set their sights in this direction. This is our political conviction and the basis for our action in this area.

Roland Hüber
Director
Directorate F - DG XIII
Commission of the European Communities

I would firstly like to congratulate those who are in Madrid and who have organised this meeting as well as those who have organised the video-conference. It is working remarkably well and this is impressive bearing in mind the difficulties facing some of the European countries with regards to tradition, linguistic differences as well as levels of compatibility.

From what I have seen, it is evidently clear that those people involved in this matter have an unequivocal vision of the future and are attentive to the progress being made. However, it is also important to remember the wider context, we are living within a global economy where education and training have not only become a prime key factor for competition but have also become part of a closer cultural and social relations, referred to as the global village. It has already been pointed out on various occasions that it is not only a matter of language but also of understanding each other's values and different approaches to problems. In today's age, we are able to communicate by travelling but we are still restrained by physical limits regarding transport. Maybe the new means of communications will provide us with some additional capabilities to overcome these restrictions. In other words, in the near future, we might be able to hold many of our meetings by means of videoconferencing, without having to travel, although it is clear that travel and personal contact will remain important and advisable. However, I believe that we will still have to progress further into the future before we can link-up classroom situations worldwide. Today's event clearly shows that technology is advancing and already offers powerful options, but I believe that it has also shown that we are far from providing the full richness of communication important to learning and essential for pedagogic acceptance, motivation and other important factors.

The transition from blackboard education to modern-age electronic education has begun, but we must also realize that we are still very far from leaping over the first hurdle.

I am personally very impressed with the progress which has been made in recent years, both within the framework of the EUREKA actions, within the framework of the Community actions and on a national level. They have demonstrated the ability as well as the willingness to seriously address the possibilities for education and training which are being offered by new technologies. Nobody can expect that a solution to this will be found on a shelf in a shopping center and one has to bear in mind that the answers to these problems require a collective and collaborative joint venture of the training domain also including the producers, operators, trainers and, last but not least, the final user.

I think that we have arrived at a very important juncture. As far as our limited efforts are concerned, we have received a further mandate covering the coming years to provide some financial incentives for future work in the domain. I find this very encouraging, especially in view of the commitment shown by those participating in the DELTA Programme as well as by the results which have been forthcoming.

Juan Rojo
Secretary of State for Universities and Research
Spanish Ministry of Education and Science

Let me begin by stating my recognition to all the people, particularly those from our host FUNDESCO, that have so thoroughly contributed to the success of this workshop. It is a very good example, to my view, of the kind of work that Spanish organizations, both public and private, have made in the Exploratory Stage of the DELTA Programme.

Let me also take advantage of this videoconferencing system to send my best regards to Mr. Hüber and Mr. Majó who have been discussing from Brussels all those exciting possibilities that information and communication technologies are bringing into the field of education and training.

It is widely recognized that success in trade and industry is very much dependent on the quality of manpower. It is then hardly surprising that one of the main subjects of the present Research and Development framework programme of the European Community deals specifically with human resources. The Spanish Government shows very much its interest and one of the highest priorities in the present Spanish Research and Development Plan is devoted to the formation and training of researchers and technologists. Jobs in modern society require people with flexible training, people capable of coming to grips with the new and complex problems and able to adapt themselves to the frequent changes in the working environment.

However, shortcomings are also recognizable. Private industry in the sector of training is not very much developed and the public sector in the field of education is perhaps biased to conventional ways of training.
Modern training is not only related to technology. The contribution of pedagogy is also badly needed. It goes without saying also that all new technologies widen significantly the choice of places where the students can be trained. Restricting the place of learning to the classroom is now certainly a superseded concept. Private homes and, above all, working places are environments where learning is feasible and efficient. These new possibilities give ample choice for people to decide what they want to learn and also how they want to learn it. Clearly promotion of interdisciplinary groups including educators, technologists and industrialists is a must.

The DELTA Programme in this Exploratory Stage has shown in practice how these new needs of training can be undertaken. Our own experience started from the use of technologies for teaching at a distance both in the field of regulated education and continuous training. But more effort is needed, particularly in connection with the future of the Spanish University for Teaching at a Distance, the UNED. In order to stimulate joint research in these areas between industries and universities, special attention will be paid to them in the Spanish Research and Development Plan to be approved soon by the Government for the 1992-1995 period.

As an example of a recent development let me point out the creation of the so-called Foundation for Technology and Training, a new initiative due to a group of private companies in the electronic and communications sector, including FUNDESCO, in association with some departments of the Government and in particular with the Ministry of Education and Science. Among others, this Foundation has devised a very specific project of training, reorienting graduated students from neighbouring areas into the software and related fields in order to fulfill the companies' necessities

of high level specialists.

Special emphasis is made in those fields where the technological pull is strong and the possibilities of formation and training of the university system are limited. An extended use of information and communication technologies is envisaged for the tuition.

In a country like Spain one should not neglect either the importance of programmes like DELTA in stimulating the development and acceptance of new technologies in the field of education and training. We sincerely hope that this contribution in connection with our own experience in the University of Teaching at a Distance will work in order to promote this kind of activity. The possibility of extending these actions to other geographical areas related culturally or linguistically is also a very attractive challenge. We sincerely hope too that in the framework of the present continuous growth of the Spanish Research and Development budget the applications of new technologies or the development of our own in the fields of education and training are going to take a significant step forward. This will certainly be an important landmark for the progress and competitiveness of our industry and research centres.

Let me just end by congratulating, on the one side, the organizers and, on the other, the attendants for what I consider a very successful workshop.

Javier Nadal
General Director of Telecommunications
Spanish Ministry of Transport, Tourism and Telecommunications

First of all, I would like to express my sincere congratulations for the work carried out during this workshop. I have no doubts that the opinions expressed by the experts and the experiences made at this event will be very useful for the future advance of technologies in the field of flexible and distance learning. Secondly, I wouldn't like to miss this opportunity of greeting our colleagues, Mr. Hüber, Mr. Majó, and all the other speakers.

The important role of telecommunications as a carrier of many other activities in the current world is present also in flexible and distance learning. This is clearly expressed in the new Workplan for the next DELTA Programme. Development in information technologies and telecommunications especially in ISDN, in the future IBC optical storage devices, and in data base management systems will allow for the exploitation and use of distributed and remote multiple media educational resources. The use of ISDN and DBS for education is just at the early stage.

A European educational network is regarded as critical for establishing a European market for flexible and distance learning. In this context the General Directorate of Telecommunications because of its own nature has a wide range of activities in research and development in the area of telecommunications. We are stressing jointly with other departments the Spanish participation in international research and development programmes with respect to telecommunications through the interministerial Science and Technology Commission, for example the R&D activities of the General Directorate of Telecommunications in the European framework or in RACE, DRIVE, DELTA and COST.

On the other hand, the major activity of the General Directorate of Telecommunications at national level is the management and follow-up of the national R&D programme of information technologies and telecommunications called PRONTIC. This programme, funded with a budget of eight thousand million pesetas for the period 1988-91 is coordinated with other bodies of the Spanish Administration and covers many different technological areas, like Artificial Intelligence, Signal Processing, Computer Parallelism, Optical Technologies, etc. But probably our implication in the future Spanish satellite HISPASAT would be the most important task for the development of the use of the trans-European training services, because we are conscious of the necessity of training people in IT&T and that training systems need IT&T. On the other hand, it is necessary to take into account the need for distance learning in a country like Spain with many areas.

I will finish by saying that the General Directorate of Telecommunications will strongly support all those activities concerning flexible and distance learning.

Appendices

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Appendix III

Programme

Monday 21 January 1991

08:30 - 09:15: ***Registration***

09:15 - ***Opening Session***
José Caballero Guerrero
General Director of Resources, Telefónica, E
Francisco Martínez Martínez
President of the Executive Committee, Fundesco, E

09:30 - ***"Research and Development for Distance Education"***
Luis Rodriguez Roselló
DELTA Office, EC
"Telecom Systems for Training"
Jacques Babot
DELTA Office, EC

10:00 - ***"EPOS: Building a Working Open Learning Service"***
Richard Walker (EPOS)
SIP, I

10:30 - ***"Education Via Satellite: Technology in the Boardroom and in the Classroom"***
Polly Rash
Ford Aerospace, USA

11:00 - *Coffee Break*

11:30 - Chairman: Brian Ross
DELTA Office

"Corporate Training by Advanced Telecommunications"
Friedrich von Stachelsky (LAT)
CONDAT DV, D

12:00 - ***"Telecommunication Based Training, OLE Project"***
Mette Ringsted (OLE)
Danish Technological Institute, DK

12:30 - ***"OLEW - The Open Laboratory for New Learning Approaches"***
Enrico Rovida (OLEW)
TEAM srl, I

13:00 - *Lunch*

14:00 - Chairman: Peter Zorkoczy
Open University, UK

"IBM Distance Learning Developments using Video-Conference"
Barry Scott
IBM, UK

14:30 - ***"Somewhere, over the Rainbow .... Pedagogical and Organizational Aspects of Satellite Based Distance Education"***
Soren Nipper
EuroPACE, F

15:00 - ***"Alternatives for EUROSTEP: a Viable Educational Broadcast or a Subsidized Testbed for Experimentation?"***
Johan van Heddegem
Eurostep, B

15:30 - *Coffee Break*

16:00 - *Round Table "Coming Technologies"*
Chairman: Jacques Babot
DELTA Office, EC

- Bartolomé Arroyo-Fernández
  RACE, EC
- Michel Coomans
  ESPRIT, EC
- Peter Zorkoczy
  Open University, UK

17:30 - *Cocktail*

Tuesday, 22 January 1991

09:00 - Chairman: Brian Ross
DELTA Office, EC

"Satellite Medical Education and Data Transfer: Opportunities and Pitfalls"
Paul Grob (SATDOC)
University of Surrey, UK

09:30 - ***"Pan European Interactive Satellite Communication for Distance Learning"***
Mehdi Nouri / Paul Bacsich (JANUS)
Marconi Open University, UK

10:00 - ***" Overview of CAPTIVE"***
David Gordon Jameson (CAPTIVE)
University College London, UK

10:30 - ***"CHANNEL e: Development of a European Educational Broadcast Service by Mass Audience Satellite"***
Philip Crookes (CHANNEL e)
The European Institute for the Media, UK

11:00 - *Coffee Break*

11:30 - Round Table ***"Implementation Issues"***
Chairman: Rogelio Segovia
Fundesco, E

- Theodor Irmer
  CCITT
- Tim Howell
  DGXIII, Commission of the EC
- Thierry Leclercq
  France Telecom, F
- Norbert Maassen
  Deutsches Bundespost, G
- Antolín Velasco
  Telefónica, E

13:00 - *Lunch*

14:00 - **Parallel Practical Demonstrations**

Presentations will be complemented by Video and PC demos,
Computer-conferencing, Video-Conferencing, Satellite transmission, ...

15:15 - ***Closing Session via Video-Conference and Satellite Transmission***
Chairman: Luis Rodriguez-Roselló
Head of Unit, DELTA Programme, EC

- Joan Majó, Conseiller hors Classe, DGXIII, EC
- Roland Hüber, Director, Directorate F - DGXIII, EC
- Juan Rojo, Secretary of State for Universities and Research, E
- Javier Nadal, General Director of Telecommunications,
  Ministry of Transport, Tourism and Communications, E

16:30h - *End of Seminar*

Commission
of the
European Communities

Directorate General XIII
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Information Industries
and Innovation
Directorate F
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